THE MARINERS NEW KALENDAR

Stampt according to a late Act of Parliament (with Three Two Penny Stamps)

BOOKS *of Navigation printed for* William Mount *and* Thomas Page.

THE Coasting Pilot for *England*, *Scotland*, *Holland*.
The E. Pilot for the Channel, E. Pilot for the *Streights*
The Eng. Pilot for the *W. Indies* Eng Pilot for the *E. Indies*.
Sea-Atlas, contain. Charts of the Sea Coast of the whole World
Great-Britain's Coasting Pilot, By Capt. *Greenvile Collins*.
The Mariners New Kalendar. By *Nathaniel Colson*.
The Mariners Magazine. By Capt. *Samuel Sturmy*, Folio.
Norwood's System of Navigation.
The Seamans Kalendar. By *Henry Philips*.
The Seamans New Kalendar. By *William Leybourn*.
The Seaman's Practice. By *Richard Norwood*.
Practical Navigation: or, an Introduction to the whole Art.
The whole Art of Navigation. By Capt. *Daniel Newhouse*.
Sherwin's Tables of Logarithms with a large New Errata.
Kersey's Algebra.
A *System* of the *Mathematics*, in 2 Vol. 4*to*, By *J. Hodgson*.
The *Compleat Modelist*, *or Art of Rigging*; shewing how to raise the Model of any Ship; and to find the Length and Bigness of every Rope, with the Weight of their Anchors and Cables.
Navigation New Modell'd. By *Henry Wilson*.
The Boatswain's Art; shewing the Art of Rigging any Ship &c
The Compleat Shipwright. By *Edmund Bushnel*, Shipwright
The Ship-Builders Assistance. By *William Southerland*
Compleat Shipwright and Mariner.
Sea-Gunners Companion. By Capt. *Povey*.
An Epitome of the whole Art of Navigation, containing an easy methodical way to become a compleat Navigator. By *J. Atkinson*.
Epitome of Navigation the Three kinds of Sailing; *Astronomy* and *Geography* with useful Tables in Naviga on. By *H. Gellibrand*.
Norwood's Epitome of Navigation, with Additions, By *J. A*
Mariner's Compass Rectified By *Andrew Wakely*, much enlarged. By *James Atkinson*.

N. B. *There are also sold all sorts of Mathematical and Sea Books, Pilots and Sea Charts for all Parts of the World*, Plain *and* Mercator; *or Books of any Subjects*; *Paper, or Paper Books, the best Ink, and all other Stationary Ware.*

THE MARINERS *NEW KALENDAR.*

Containing

The Principles of Arithmetick and Geometry; with the Extraction of the Square and Cube Roots. Alſo Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the ſame.

Together with

Exact Tables of the Sun's Place, Declination, and Right-Aſcenſion. Of the Right Aſcenſion and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverſe.

ALSO,

The Deſcription and Uſe of the Sea-Quadrant, Fore-Staff and Nocturnal. The Problems of Plain-Sailing and Aſtronomy, wrought by the Logarithms, and by *Gunter's* Scale. A Tide Table. The Courſes and Diſtances on the Coaſt of *Great Britain*, *Ireland*, *France*, &c. And the Soundings coming into the Channel. With Directions for ſailing into ſome Principal Harbours.

BY

NATHANIEL COLSON, *Student in the Mathematicks*

London, Printed for *William Mount* and *Thomas Page*, at the *Poſtern* on *Tower-Hill*. 1735.

Where you may have all Sorts of Mathematical and Sea Books.

To the Ingenious *Mariner*.

I Here present thee with a New Kalendar, *wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practised) but to make Things plain and practicable. Here is nothing obscure or difficult to discourage young Beginners (for whom 'tis intended) but all Things treatd of with as much Plainness (both of Matter and Method) as possible; and I assure thee were I present to instruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially useful, having respect to the design'd bigness of the Volume. The* Contents *are asfollow:*

The Principles of Arithmetick, *with which I begin, because I am sensible of the Loss some have been at, that have attempted* Navigation *before they have understood something of it; the* Extraction of the Square and Cube Roots: *In all which I have endeavoured to apply the Examples to Sea Affairs. Some necessary* Geometrical Problems, *useful in* Navigation. *Directions for finding the* Prime, Epact, Moon's Age, *and the* Time of Full Sea (*both according to the Ordinary and a more accurate Way*) *with* Tables *for the same.*

Tables of the Sun's Place and Declination, with Directions and Examples to every Case, how to use the Declination to find the Latitude: As also the necessary Tables for correcting the Declination, when the Difference of Longitude is considerable from the Meridian of London, *for which the said Tables of Declination are calculated. A Table of the Sun's Right Ascension. A Table of the Right Ascension and Declination of some of the principal Fixed Stars, with the use of the said Tables in finding the Time of a Star's coming to the Meridian; as also Directions at large for Observation of any of the said Stars to find the Latitude of the Place, with Examples in each Case. The Description of the* Sea-Quadrant, Fore-staff *or* Nocturnal. *A Table of Latitude and Longitude of the principal Places on the Sea-Coast collected from the best Information. Problems of* Plain Sailing *and* Astronomy, (*which that the* Practitioners *might learn two things at once*) *are wrought both by the* Logarithms, *and* Gunter's *Scale. A large and very useful Table of Difference of* Latitude *and* Departure *to every Degree and Quarter Point of the Compass: With its use in working a Traverse in order to keep a Reckoning at Sea. A* Rutter *for the Coast of* Great Britain, France, Ireland, Spain, Portugal, *&c. Shewing the Bearing and Distance from one Place to another. A Table of the* Soundings *coming into the* Channel, *giving the Depth of Water, and Quality of the Ground Lastly, Directions for sailing into some principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayest, if thou wantest Information in any of these Things, and dost but a little carefully animadvert upon what thou readest) I have my End: And thy kind Acceptance hereof will further Oblige me.*

Who am thy Friend,

Nathaniel Colson.

The Principles of Arithmetick briefly and plainly demonstrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetick*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made, and firſt of

Numeration.

NUmeration is that part of *Arithmetick*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0,
One,	*Two*,	*Three*,	*Four*,	*Five*,	*Six*,	*Seven*,	*Eight*,	*Nine*,	*Cypher.*

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or to the Right Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to their Places they are ſet in, as 1 in the firſt Place, or Place of *Units*, is *One*; in the ſecond Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given *Number*; As 123 which *Number* conſiſting of three Places, is thus numbred, *One Hundred Twenty Three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred, Twenty Three Thouſand, Four Hundred fifty ſix*; and this *Number* 123456789, conſiſting of nine Places, is thus numbred, *One Hundred twenty three Millions, Four Hundred Fifty ſix Thouſand, Seven Hundred Eighty Nine.*

Addition

Addition is that which of several Sums makes but one Sum.

Example. Suppose four Men (A. B. C. D.) owe me several Sums of Money, I would know how much is due to me in the whole: I begin at the first Row towards the Right Hand and say, 3 and 6 is 9 and 2 is 11, and 4 is 15; setting down the 5 under the Row added up; then I carry the 1 ten to the next Row, saying 1 and 4 is 5, and 5 is 10 and 3 is 13, and 6 is 19; set down 9 under the Row added up, and carry one to the next row, saying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; set down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which because this is the first row, I set down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thousand, Nine Hundred, Ninety five Pounds.*

A	oweth	3564
B	—	5432
C	—	3156
D		1843
		13995

Characters used in Arithmetick

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

Examp. 2. Suppose I have several Creditors to whom I owe several Sums of Money, I desire to know the whole

Therefore begin again (as always in *Addition*) at the Right-hand, I say 11 and 10 is 21, and 4 is 25, and 6 is 31; now considering how many Shillings there are in 31 *d.* I find 2*s.* and 7*d.* wherefore I set down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, saying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* set down 14*s.* and carry the 1*l.* to the next row, saying, 1 and 3 is 4, and 6 is 10, add 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1: Lastly, 1 and 1 is 2; so that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppose at Sea, keeping my Reckoning in Degrees and Minutes, having six Days Difference of Longitude. I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, set down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; saying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7; so that the whole Difference of Longitude made these 6 Days, is 7 Degrees and 26 Minutes.

	°	′
1 Day	1	06
2 —	0	56
3 —	1	09
4 —	2	00
5 —	1	02
6 —	1	13
0	7	26

Subtract

Subtraction is the taking of a leſs Sum out of a greater, and finding the Remainder

	l.	s.	d.
Example. Suppoſe a Man oweth me	376	13	09
And hath paid me	211	05	03
I deſire to know what remains unpaid, which is	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 1 I go to the next Row, and ſay; 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3, there remains 1: ſo there remains due of the ſaid Debt, *One Hundred Sixty-Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppoſe the Diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to Sail.

Therefore placing 396, under the 1000, I ſay, 6 from 0 I cannot, but 6 from 10, there remains 4; proceeding to the next Figure I ſay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

	Miles,
	1000
	396
	604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32, there remains 22, which Place under the Minutes; then for the Degrees, 2 from 1 I cannot, but two from 11 there remains 9, then one that I borrowed, and 4 is 5, 5 from 5 there remains 0.

	°	′
	51	32
	42	10
	9	22

So the Difference ſo of Latitude is 9 Deg. 22 Min.

Multiplication.

Multiplication is that which ſerves inſtead of many Additions by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by the Number of the leſſer which is contained in the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts

1. The Multiplicand, or Number to be multiplyed
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the Table which is firſt to be committed to Memory. The

The Multiplication TABLE.

2 times	2	is	4	4 times	4	is	16	7 times	7 is 49
	3		6		5		20		8 is 56
	4		8		6		24		9 is 63
	5		10		7		28		
	6		12		8		32		
	7		14		9		36	8 times	8 is 64
	8		16	5 times	5	is	25		9 is 72
	9		18		6		30		
3 times	3	is	9		7		35	9 times 9 is 81	
	4		12		8		40		
	5		15		9		45		
	6		18	6 times	6	is	36		
	7		21		7		42		
	8		24		8		48	10 times 10 is 100	
	9		27		9		54		

Example 1. I demand how many Shillings there is in 5648 *l.*

To Answer this, multiply the given Number of Pounds by 20, Thus; The first being 0 Cypher, set down 0 underneath the first Figure; and then proceed to the next Figure, and say, 2 times 8 is 16; set down 6 under the second Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, set down 2, and carry 1; lastly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648 *l.* multiply'd by 20, makes 112960 Shillings.

l.
5648
20
112960

Example 2. In 276 Degrees how many Minutes?

First set down ——— 279
Then (because 60 Minutes make a Degree) multiply by ——— 60
The Product is ——— 16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Example. 3. Multiply —— 8765437 Multiply —— 47632867
By —— 32 By —— 4352

	17530874	95265734
	2629311	238164335
Product	280493984	142898601
		190531468
		207298237184

DIVISION.

Division is that which serves in the Room of many *Subtractions*, and is useful in reducing all Numbers of a lesser Denomination into a greater, as Minutes in Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It consists of Three Parts, *(viz.) Dividend* or the Num-

Number to be divided; Diviſor, or the Number to divide by; and the Quotient, alſo if any Number remain it is called the Remainder.

Ex. 1. To divide 7834 by 23: firſt ſay, how many times 2 in 7; Or how often 23 in 78, the Anſwer will be 3 times, which place in the Quotient, then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying 3 times 3 is 9, and 3 times 2 is 6, and place theſe under the two firſt Figures of the Dividend, and draw a Line; ſubtracting 69 from 78 there reſts 9, which ſet underneath, and place a Point under 3, to ſhew that it's brought down; place it to the 9, then proceed, ſaying how many times 23 in 93, or how many times 2 in 9: which will be 4 times; place 4 in the Quotient, by which multiply the Diviſor: again placing the Product which is 92 under 93 and draw a Line, and ſubtract it there from, the Remainder 1 put under the Line, and ſet down 4 the laſt Figure in the Dividend, putting a point under it, and place it to the remaining 1: then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſor.	*Dividend.*	*Quotient.*
23)	7834	(340
	69	
	93	
	92	
	14 Remainder	

Ex. 2. In 360 Minutes how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree, and becauſe the laſt Figure of the Diviſor is a Cypher, I cut it off, and with it the laſt Figure of the Dividend, which is here alſo a Cypher, and divide 36 by 6 (which is the ſame thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay how many times 6 in 36? The Anſwer is 6 times: which I place in the Quotient, and proceed to multiply the Diviſor 6, but the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0, ſo that by this Work it appears that in 360 Minutes there are 6 Degrees juſt.

Diviſor.	*Dividend.*	*Quotient*
60)	360	(6
	36	
	00	

Example 3. A Ship taken by 253 Men, is valued at 59875*l.* I Demand each Man's Share, being equally divided.

Diviſor	*Dividend*	*Quotient*
253)	59875	(236
	506	
	927	
	759	
	1685	
	1518	
	167	

	253
	236
	1518
	759
	506
	167
Proof	59875

Firſt, ſay how many times 2 in 5? The Anſwer is two times. which place in the Quotient; then multiply the Diviſor 253 by 2, the Figure placed

placed in the Quotient, ſaying 2 times 3 is 6, 2 times 5 is 10, ſet down 0, and carry 1 ; 2 times 2 is 4, and 1 is 5, which ſet down under the 3 firſt Figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and ſet it after 92 the Remainder ; then ſay how often 2 in 9 Anſwer 3 times (for 4 will prove too many.) Then multiply the *Diviſor* 253, as before, by 3, the Figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the figures above, the Remainder will be 168, then take down 5, and point it as before, ſetting it after 168, the laſt Remainder : And again, ask the Queſtion, how often 2 is contained in 16 ? Anſwer 6 times ; by which 6, when ſet in the Quotient, multiply the *Diviſor* 253 ; and the Product is 1518, which place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſhed, each Man's ſhare being 236*l.* and 167*l*, over, which is to be divided among them ; which may eaſily be done, by multiplying 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor*, by 236 the Quotient ; then taking in 167 the Remainder under the three laſt figures, the Product will make the ſame with the *Dividend*, as you ſee in the Operation.

The Rule of THREE.

IS that, which having three Numbers given, a fourth Number is found in Proportion thereunto ; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſion is the anſwer to the Queſtion.

Example 1. If in 24 hours a Ship ſails 130 Miles ; How many Miles will ſhe ſail with the ſame Gale in 192 Hours or eight Days ?

Hours	Miles	Hours
24	130	192

130
192
5760
24960

24) 24960 (1040 Miles in 192 Hours
24
96
96
00

Here 24 is the firſt Number, 130 the ſecond, 192 the third ; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960, by 24 the firſt Number, which gives in the Quotient 1040 Miles, which is the way the Ship will make in 192 Hours the time propoſed.

Example 2. If 112 lb. of Tobacco coſt 6 *d.* what will 112 lb. coſt ?

112
6
12(672 (Pence or 56 Shillings.)

Here

Here the firſt Number being an Unit, which neither multiplies nor divides, it ſaves the Labour of Diviſion, and the anſwer is 672 d. (for the Anſwer will be of the ſame Name with the ſecond Number) which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 lb. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards, How high is that Caſtle whoſe Shadow is 100 Foot?

Which Queſtion, for the more ready Solution, ſtate thus;

If 6 Foot (which is 2 Yards) give 9 Foot, what ſhall 100 Foot give

By the Operation it appears, the ſaid Caſtle muſt be 150 Foot high.

9
6)900(150 Foot.
6
30
30
00

Example 4. If 564 *l.* 12*s.* 6*d.* is to be divided between 165 Men, how much is one Man's Share?

Firſt, reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Ponnd) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292 multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l.* 12*s.* 6*d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but here it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing. *The Operation follows.*

564*l.* 12*s.* 6*d.*
20
11292
12
22590
11292
165(135510(821 Pence
1320
351
340
0210
0165
45

12)821(68 Shillings equal
72 to *L* 3. 8*s.* 5*d.*
101
96
5 Pence

Note, That in the *Rule of Three*, the first and third Number must be both of one Denomination, and the second must be brought into the lowest Value expressed therein, as in the foregoing Example. I work not the Question as it was first stated, but transposing the Numbers I put the Denomination of Men first and last, and the Money in the midst, to answer to that part of the Rule, which requires the first and third Numbers to be both of one Name. The answer thereof in the preceeding Question, as by the Operation appear, 821 pence; which reduced into Shillings, is 68*s.* and 5*d.* or 3*l.* 8*s.* and 5*d.* which is one Man's Share, which was requir'd

The next thing I shall briefly treat of, is *The Extraction of the Square and Cube Roots*, as also somewhat of their Use.

The Extraction of the Square Root.

Example 1. TO extract the Square Root of 7056 proceed thus: First point the given Numbers (that is, put a Prick over every other Figure, beginning at the first Figure at the Right-hand, and note by the way that so many Points as the said Number admits over it, of so many Figures consists the Root of the said Number, then proceed seeking the greatest square Number (which is a Number multiplyed by it self,) in the first point towards the Left hand (70) which is 64 constituted of 8 multiplyed into itself; for 8 times 8 is 64. The Root of the square Number which is 8, place in the Quotient and subscribe the square Number (64) under the said first Point, subtracting it therefrom, and setting down the Remainder, (6) underneath: To this Remainder bring down the next Point (56) then drawinga crooked Line, on the Left hand of the Dividend (656) double the Quotient, and place it *(viz.* 16*)* therein, calling it the Divisor, seek how often the Divisor is contained in all the Figures of the Dividend, save the last to the Right-hand, *(viz.)* How many Times 16 in 64? The Answer is 4 times, which place in the Quotient, and also in the Right hand of the Divisor (16) then multiply the Divisor (164) by the 4 last placed in the Quotient, and put the Product, which is 656, under the Dividend, subtracting therefrom; which done, nothing remains. So that the square Root of 7056 is 84.

```
7056(84 Root
64
---
164(656 Divisor
656
---
000
```

The square Root is applied to Navigation as follows.

Any two sides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppose a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Distance to be required, the said Distance is found by Extraction of the square Root, as follows.

The Rule. Square the Difference of Latitude and Departure severally (that is, multiply each by it self) and from the Sum of both the Squares added together, extract the Square Root, which will be the Distance required.

Ex.

Example.

Difference of Lat. 87. The Departure 71. Square Diff. Latit. —— 7569
Multiplied by itself 87. Multip. by self. 71. Square Departure —— 5041
609 71 12610
696 497
The Square —— 7569 The Square 5041

12610(112, the Distance required.
1
21)026
21
222) 510
444
66

By this Operation it appears, that the Distance, omitting the Fraction, is 112 Miles.

Examp. 2. Suppose a Ship's Distance to be 111 Miles, and her Departure 57 Miles, and the Difference of Latitude to be required; the said Difference of Latitude is found by the Extraction of the square Root, as follows.

The Rule. From the square of the Distance subtract the square of the Departure, and the square Root of the Remainder will be the Difference of Latitude required.

Example. The Distance —— 111 —— The Departure —— 57
Multiplied by it self —— 111 —— Multiplied by it self 57
111 399
111 285
111 Sq. of Departure 3249
Square of the Distance 12321
Square of the Dep. subtract 3249 9072(95 Diff. Lat. required.
Remains 9072 81
185)972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the square of the Distance, subtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation, for Brevity sake is omitted.

Having proceeded thus far in sheweth the *Practitioner* how to find the Distance, Difference of Latitude and Departure (any two of them being given) without *Trigonometry*, I shall shew the manner of finding the Course exact enough for common Use) without the said Operation, which in done as follows

The Proportion to find the Course. As the Sum of the Hypothenuse (or Distance) and half the greater of the other two Legs (*viz.*) if the Difference

of

of Latitude be moſt, half that, but if the Departure be moſt, half that; I ſay; As the Sum of theſe two is in Proportion to the leſſer (or remaining) Leg. ſo is 86 to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Complement of the Courſe.

Examp. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is ——— 110
Half the greater Leg (38) is ——— 44
The Sum ——— 154

Having thus done, ſay by the *Rule of Three.*

As the ſaid Sum 154 is to 66 the leſſer Leg, ſo is 86 to the Courſe

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60 (the Number of Minutes contained in a Degree) and divide the Product by the *Diviſor* (154) and the Quotient of the ſaid *Diſion* gives for the anſwer 51 Minutes: So that the Courſe required is 36 deg. 51 minutes.

66
516
516
154(5676(36 deg 51 min.
462 132
1056 60
924 154(7920(51
132 770
220

Example 3. *Extraction of the ſquare Root.* Suppoſe a Rope of 5 Inches Compaſs, and another Rope of double the ſtrength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the ſquare Root*: For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is 4 times the ſtrength of that of 5.

The Rule, Take the Compaſs of the given Rope (*viz.* 5) and multiply that by itſelf; which Product (becauſe the other Rope is to be twice as ſtrong) multiply it by 2, and the ſquare Root of the Product is the Compaſs of the Rope required. *Inc.*

Example. The given Rope's Compaſs 5 Inches, Extract the Root 50(7

Multiplied by itſelf ——— 5
The Square ——— 25
Multiplied by ——— 2
50
49
1

So that by the Operation it appears a Rope to be twice the ſtrength of the given Rope of 5 Inches Compaſs, muſt be 7 Inches and a little better.

If it's deſired to know the weight one Rope by another, 'tis as follows,

The Proportion is, as the ſquare of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the weight of the one to the weight of the other, Length for Length: *Ex.* Suppoſe a Cable of 10 Inches to weigh 25 Hundred, and the weight of a Cable of 8 Inches required, Say, as 100 (the Square of 10) is to 64 the ſquare of 8; ſo is 25 C. the weight of one Cable to 16 C. the weight of the other required. *Ex-*

Extraction of the Cube Root.

I Shall first, as necessary, insert a Table of the Cubes of the Nine Digits which ought to be committed to Memory.

Cubes of the Nine Digits

1 — 001	4 — 064	7 — 343
2 — 008	5 — 125	8 — 512
3 — 027	6 — 216	9 — 729

Example 1. Extract the Cube Root of 12167

First, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right Hand) then seek the greatest Cube in the first Point (*viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; subtract the Cube (8) from the first Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this Resolvend, then draw a Line underneath it, then square the Quotient 2, which is four; multiply the said Square (4) by 300, which makes 1200; place this under the Resolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30 which makes 60; place this under the Triple Square; and call it the Triple Quotient, add these two (*viz.*) Triple Square and Triple Quotient into one Sum, and call it the *Divisor*; seek how often this *Divisor* is contained in the Resolvend, which is three Times; which three placed in the Quotient, multiply the Triple Square by the Figure 3 last placed in the Quotient, and subscribe the Product underneath the *Divisor*; square the said Figure (3) last placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the last Product; Cube the Figure (3) last placed in the Quotient, and place it under the preceeding Products. Lastly, add these three Products into one Sum, subtracting the said Sum from that Resolvend, subscribe the Remainder; to which Remainder had there been any more Figures, the next point must have been brought down, and the preceding Work repeated from the Squaring of the Quotient, untill all the Figures are so brought down; But to this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

```
12167(23 Root
 8
-----
4167 Resolvend
1200 Triple Square
  60 Triple Quotient
-----
1260 Divisor
3600
 540
 627
-----
4167
-----
 000
```

Exmple 2. *Applied.* Suppose a Ship of 30 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 Foot deep in the Hold; another Ship is desired of the same Mould and Shape of 500 Tuns the several Dimensions of the Ship are found by the Extraction of the Cube Root. *Example.* Beginning with the Keel. Frst, Cube the length of the given Keel, which is done by multiplying it into itself, and then multiplying the Product by it again.

Then

Then say by the Rule of Three; As 300 Tun the one Ship's Burden; to 500 Tun the other Ship's Burthen; so is 421875 the Cube of one Ship's Keels Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{8}{10}$ parts.

Thus having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three.

Thus, suppose the next thing I would find be her Breadth by the Beam, say, As the Length of the one Ship's Keel 75, is to the length of the other 89*fere*: So 29 $\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot.

So you may find the Depth in the Hold, *&c.*

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9 lb. required, the Diameter of a Shot of any other Weight, suppose of 72 lb. This is also done by Extraction of the Cube Root as follows:

First, say, by the Rule of Three,

As 9 lb. the Weight of one Shot, to 72 lb. the weight of the other; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter; which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

75 given Keel
75
375
525
5625
75
28125
39375
421875 Cube given Keel

703125 $88\frac{8}{10}$ Root
512
191125 Resolvend
192000 Triple Square
240 Triple Quotient
19440 Divisor
153600
15360
512
169472
21653000 Resolvend
2323200 Trip. Square
2640 Tr. Quotient
2325840
2090880 Divisor
113340
729
21123369
529631 Remainder

But if it were required to find the Weight of a Shot by the Diameter it's done thus, by the Rule of Three.

As the Cube of the one Shot's Diamer, to the Cube of the other; So is the Weight of the one Shot, to the Weight of the other required.

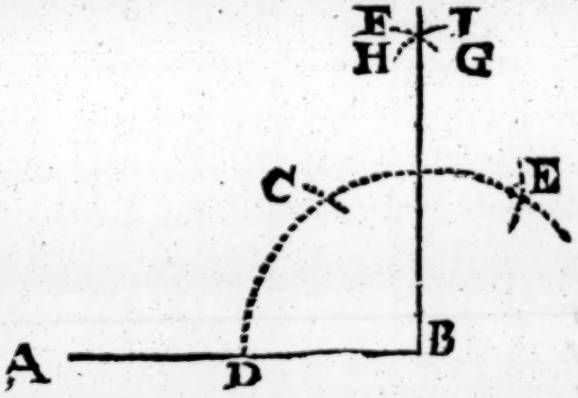
And thus much for the Arithmetical Part of this Treatise.

Some

Prob. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*

LET the Line given be AB, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances CA and CB. Then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB with one Foot of the Compaſſes in the Point A, deſcribe the Arch DE; then with the ſame Extent, and one Foot in the Point B, deſcribe the Arch FG, then draw the Perpendicular from the Point C, through the Interſection, (or Cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*

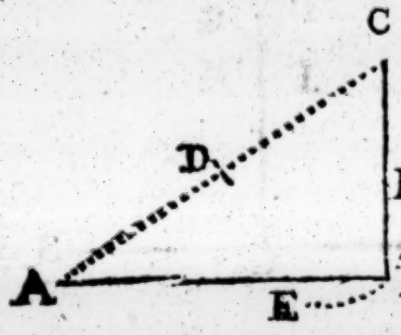


Let the Line given be A B the Perpendicular to be raiſed from the point B, to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E; then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch FG; and placing the Compaſſes in the Point E, deſcribe the Arch HI then from the Point B, and through the Interſection of the two Arches FG and HI draw the perpendicular which was required.

III. *To let fall a Perpendicular from a Point aſſigned over a given Right Line.*

Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall, to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient Diſtance, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch GH; then from the Point C, and thro' the Interſection of the ſaid two Arches, draw the Perpendicular CD which was required.

Prob. IV. *Another way to let fall a Perpendicular from a given Point on a given Right Line.*



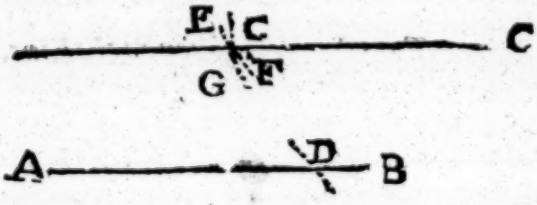
Let the Line given be AB, upon which let it be required to let fall a Perpendicular from the Point C; to do which from the Point aſſigned C, draw the Line C A; which Line divide into two equal Parts, as in the point D, then one point of the Compaſſes reſting in the Point D, with the ſame Diſtance, (*viz.* of half the Line A C) deſcribe the Arch E F; then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

Prob. V. *To draw a Line Parallel to a Line given.*

Let AB be a Line given, to which it is required to draw a Line parallel; to do which, firſt take in the Compaſſes the Diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line AB, deſcribe the Arch E; and with the ſame Diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F, then laying a Ruler to touch the Convexity of the two Arches, draw the Parallel Line FE.

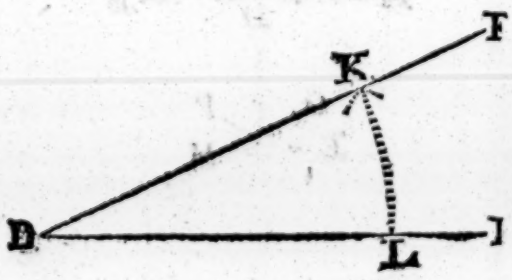
Prob. VI. *To draw a Right Line parallel to a given one, that ſhall paſs thro' a Point given.*

Suppoſe AB the given Line, and it's required to draw a Line parallel thereto, that ſhall paſs through a given Point as C.



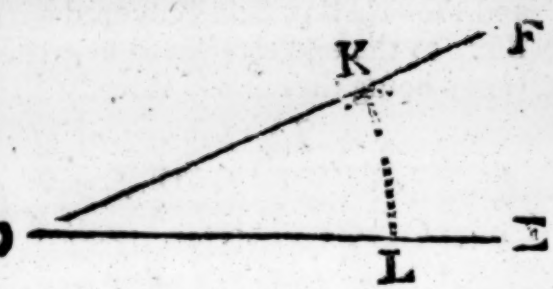
Set one Foot of the Compaſſes in C, with the other at any Diſtance croſs AB in D, and with that Diſtance from any Point, as A, of the Line AB deſcribe an Arch EF; then from C with the Diſtance AD croſs the Arch in G; draw the Line CG which ſhall be parallel to the given Line AB as was required.

Prob. VII. *To make an Angle equal to any Angle given.*



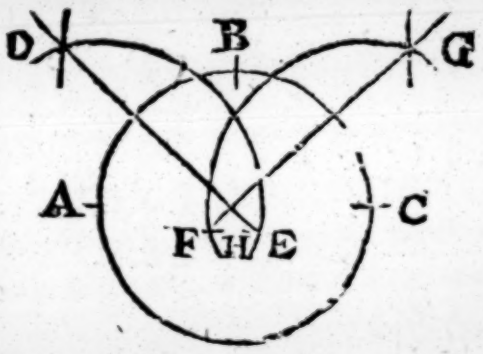
Suppoſe F D E an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line D E, then with any convenient Diſtance leſs than D E, deſcribe the Arch K L, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the Arch K L,

KL, ſweep the Arch KL; take the Arch KL, in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then thro' the Point K draw the Line DKF, then is the Angle EDF equal to the Angle EDF as was required.



Prob. VIII. *To bring any* 3 *Points not ſituate in a Right Line into the Circumference of a Circle.*

Let the three Points thro' which the Circle is to paſs be ABC: Take above half the Diſtance between the two Points A and B in the Compaſſes; and one Foot of the Compaſſes being in the Point A, with the ſaid Diſtance deſcribe the Arch ED, and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch E D in the Points E and D, and draw the Right Line E D; then take above half the Diſtance between the Points C and B in the Compaſſes, and one Foot of the Compaſſes being in the Point C, with the ſaid Diſtance deſcribe the Arch FG: and with the ſame Diſtance one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now were the two Right Lines DE and FG, being continued, interſect each other (*viz.* in the Point H) is the Center of the Circle, which was required.



The Deſcription of the Mariners Compaſs.

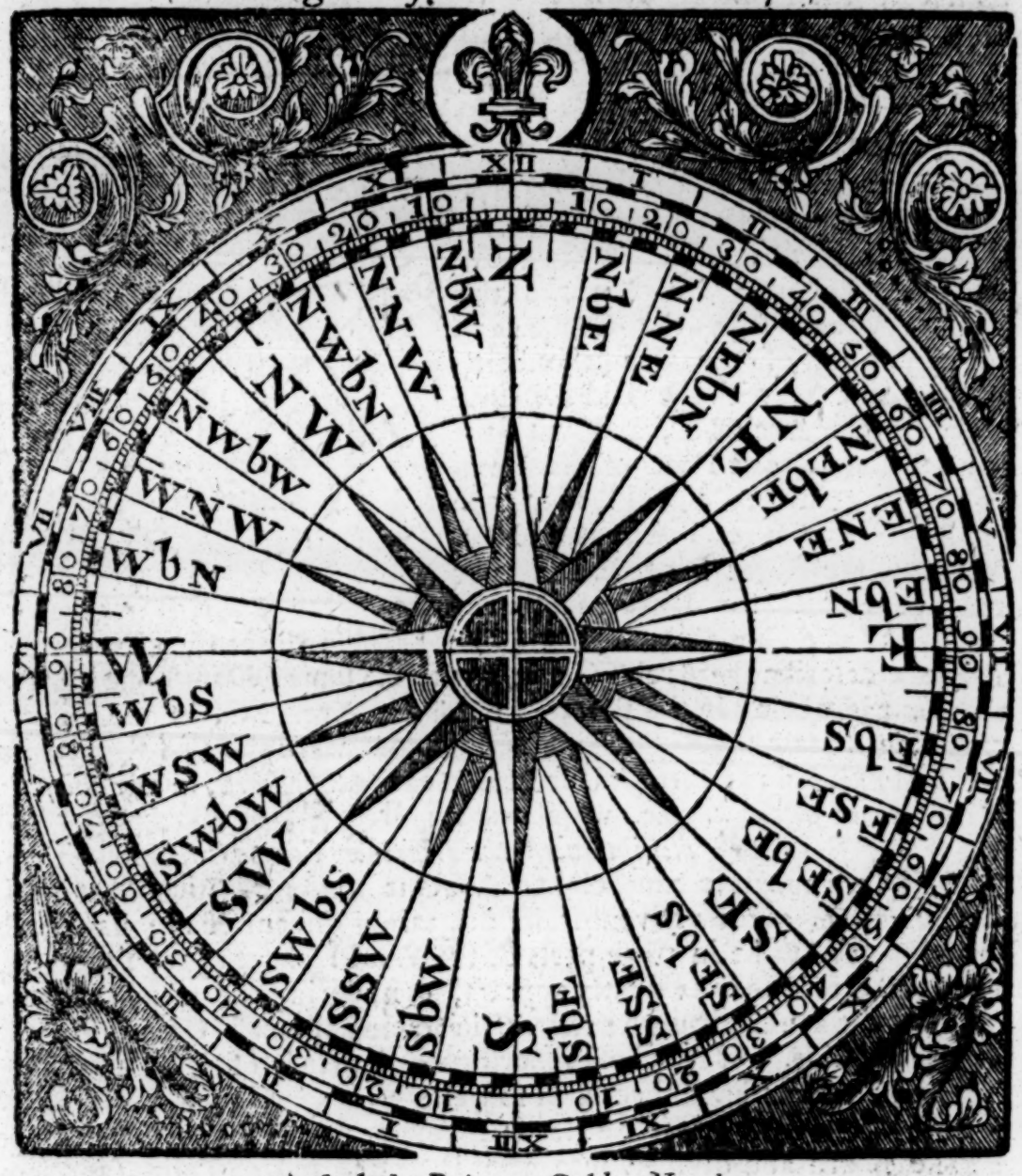
THIS Inſtrument ſo beneficial an Aſſiſtant to the Practical Part in Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe parts of the World about 300 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniences that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well

It is Circle of a greater or leſſer Diameter at pleaſure, deſcribed upon a Paſte Board and divided into 360 Degrees, and 32 Points (and ſometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Chard or Paſte Board, there are paſted on the other ſide of the ſaid Chard or Paſte board, two Wires, which Wires being touched with a Loadſtone, and the Chard hung at the Center upon a Pin, fixed in a Box, its Poſition becomes North or South;

and the ſaid Box being covered with a Glaſs, and hung in another Square Box, to the end the Chard may traverſe notwithſtanding the Ship's Motion; being thus fixed, is ready for Uſe.

The Figure of the Mariner's Compaſs.



To find the Prime or Golden Number.

THE *Prime*, or *Golden Number*, is a Revolution of nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on nineteen Years before.

To find which add one to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number. *Example*

Example. To find the *Golden Number* for the Year 1733, add 1, which makes 1734; which divide by 19

19) 1734(91
171
24
19
5

The Remainder 5 is the Golden Number for the Year 1733.

To find the Epact.

THE Epact is the Number of Days that the Solar Year of 365 Days exceeds the Lunar Year (or 12 Revolutions of the Moon to the Sun of 354 Days, the Difference being 11 Days: When the Golden Number is 1, the Epact is 11, when 2, the Epact is twice 11 or 22, when 3, thrice 11 or 33 rejecting 30) that is 3, *&c.* and it's thus found: divide the Prime by 3, if 0 remain, the Epact is the same with the Prime, if 1 remain add 10, if 2, add 20, to the Prime, the Sum (rejecting 30, if need be) is the Epact.

Example. In the Year 1733, the Golden Number is 5; which divide by 3, there remains 2; for which 20 added to the Golden Number 5 makes the Epact 25.

In the Year 1729, the Golden Number is 1, which added to 10 (because 1 cannot be divided by 3) makes 11 for the Epact.

In the Year 1734 the Golden Number is 6, which divided by 3, there remains 0, therefore the Epact is 6, the same with the Golden Number.

Or multiply the Golden Number by 11, and divide the Product by 30, the Remainder is the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *August* 6, for *September* 8, for *October* 8, *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required. These three Sums added together, if less than 30 is the Moons Age; if more than 30, take 30 from it as often as may be, the Remainder is the Age of the Moon. The Moon's Age subtracted from 30, leaves the Day of the Change. Again, 15 added to, or subtracted from the Day of Change, leaves the Day of full Moon.

Example. Suppose it were required to find the Moon's Age for the first Day of *April*, 1733.

First, set down the Epact for the Year——25
To which add the Number for the Month, which is——2
To that add the Day of the Month, which is——1
Sum, gives the Moon's Age——28 Days

Then out of 30,
Take——28 The Moon's Age
Remains—— 2 Days to Change
Add ——15
Makes ——17 Days to the Full Moon.

To

To find the Cycle *of the Sun.*

To find the Moon's Southing by her Age, ſee in the Uſe of the Tide-Table, which follows immediately after it.

To find the Dominical Letter.

TAKE the Year and it's fourth Part, and add 4 to it; then divide that Sum by 7, and ſubtract what remains from 7, the Remainder ſhews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe the Dominical Letter was required for the Year —— 1733

First, ſet down the Year —— 1733
Then the 4th part, which omitting Fractions is —— 433
To which add —— 4

2170

The Sum divided by —— 7)2170(310
21
07
7
00

The Remainder after Diviſion is 0, which being ſubtracted from 7, leaves 7; which ſhews it muſt be the ſeventh Letter, which is G, the Dominical Letter for the Year 1733. But when it is Leap Year, there are two Dominical Letters, and then the Letter thus found ſerves from the laſt of *February*, to the end of the Year.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year 1733
Then add —— 9
Divide by —— 28)1742(62
168
62
56
6

By the Operation it appears that 6 is the Cycle of the Sun for the Year 1733, being the Remainder after the Diviſion.

Note, *Hillary* Term begins *Jan.* 23, and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends 19 Days after.

Michaelmas Term begins *October* 23, and ends *November* 28.

Months		D	H.
January	First quart	01	03 A
	Full moon	08	11 M
	Last quart.	15	11 A
	New moon	23	12 A
	First quart.	31	01 M
Febr.	Full moon	06	05 M
	Last quart.	14	07 A
	New moon.	22	01 A
March	First quart	01	11 M
	Full moon	08	01 A
	Last quart.	16	01 A
	New moon	23	12 A
	First quart	30	09 A
April	Full moon	07	04 M
	Last quart.	15	05 M
	New moon	22	10 M
	First quart.	29	06 M
May	Full moon	06	07 A
	Last quart.	14	06 A
	New moon	21	05 A
	First quart.	28	04 A
June	Full moon	05	11 M
	Last quart	13	04 M
	New moon	20	01 M
	First quart.	27	02 M

Months.		D	H.
July	Full moon	05	03 M
	Last quart.	12	01 A
	New moon	19	08 M
	First quart	26	04 A
August	Full moon	03	05 A
	Last quart.	10	09 A
	New moon	17	05 A
	First quart	25	08 M
September	Full moon	02	06 M
	Last quart.	09	05 M
	New moon	16	04 M
	First quart	24	01 M
October	Full moon	01	05 A
	Last quart.	08	03 A
	New moon	15	06 A
	First quart.	23	07 A
	Full moon	31	04 M
November	Last quart.	07	01 M
	New moon	14	11 M
	First quart	21	12 M
	Full moon	29	03 A
December	Last quart.	06	01 A
	New moon	14	06 M
	First quart.	23	03 M
	Full moon.	29	02 M

The Year 1734 *hath two Eclipses, both of the Sun.*

The first will be on *April* 22d, invisible

The second will be on the 15th of *October*, invisible.

Months.		D	H
January	Last quart.	05	03 M
	New moon	13	02 M
	First quart.	20	04 A
	Full moon	27	01 A
Febru.	Last quart.	03	07 A
	New moon	11	08 A
	First quart.	19	03 M
	Full moon.	25	12 A
March	Last quart.	05	01 A
	New moon.	13	noon
	First quart	20	01 A
	Full moon.	27	11 M
April	Last quart.	04	06 M
	New moon	12	01 M
	First quart.	16	09 A
	Full moon.	25	11 A
May	Last quart.	03	10 A
	New moon	11	09 M
	First quart.	18	05 M
	Full moon	25	12 M
June	Last quart.	02	01 A
	New moon	09	05 A
	First quart.	16	01 A
	Full moon.	24	03 M

Months.		D.	H
July	Last quart.	02	01 M
	New moon	09	01 M
	First quart	15	11 A
	Full moon.	23	07 A
	Last quart.	31	11 M
August	New moon	07	08 A
	First quart.	14	10 M
	Full moon	22	11 M
	Last quart.	29	09 M
September	New moon	05	05 A
	First quart.	13	03 M
	Full moon	21	02 M
	Last quart.	28	06 M
October	New moon	05	03 M
	First quart.	12	07 A
	Full moon	20	05 A
	Last quart	27	04 A
November	New moon	03	03 A
	First quart.	11	01 A
	Full moon	19	05 M
	Last quart.	26	03 M
December	New moon	03	07 M
	First quart.	11	10 M
	Full moon	18	05 A
	Last quart.	25	03 A

The Year 1735 *hath four Eclipses, two of the Sun and two of the Moon*

The first will be an Eclipse of the Moon *March* the 27th, invisible
The 2d will be an Eclipse of the Sun, on *April* the 11th, invisible
The third of the moon, *Sept.* 21st at 2 in the Morning vis. 7 digits
The fourth will be of the Sun, on the 4th of *October*, invisible.

Months		D.	H		Months.		D	H
January	New moon	02	01 M		*July*	First quart.	04	01 A
	First quart.	10	02 M			Full moon	11	07 A
	Full moon	17	04 M			Last quart.	19	08 A
	Last quart.	24	02 M			New moon	27	01 M
	New moon	31	08 A					
Febru.	First quart.	08	04 A		*August*	First quart.	02	09 A
	Full moon	15	02 A			Full moon	10	10 M
	Last quart	22	02 A			Last quart.	18	09 M
						New moon.	25	09 M
March	New moon	01	04 A		*September*	First quart	01	07 M
	First quart.	09	04 M			Full moon.	09	02 M
	Full moon	15	12 A			Last quart.	16	09 A
	Last quart.	23	06 M			New moon	23	06 A
	New moon	31	09 M			First quart.	30	08 A
April	First quart.	07	02 A		*October*	Full moon	08	09 A
	Full moon	14	11 M			Last quart.	16	07 M
	Last quart	21	11 A			New moon	23	03 M
	New moon	29	10 A			First quart	30	09 M
May	First quart.	06	10 A		*November*	Full moon	07	02 A
	Full moon	13	08 A			Last quart.	14	06 A
	Last quart.	21	02 A			New moon	21	03 A
	New moon	29	08 M			First quart.	29	07 M
June	First quart.	05	05 M		*December*	Full moon	07	05 M
	Full moon	12	07 M			Last quart.	14	04 M
	Last quart.	20	06 M			New moon	21	05 M
	New moon	27	05 A			First quart.	29	03 M

This Year hath six Eclipses, four of the Sun and two of the Moon

The first will be of the Sun, *March* the 1st, invisible.

The second will be of the Moon, *March* the 15th, visible and total

The third will be of the Sun, *March* the 30th, invisible.

The fourth will be of the Sun, *August* the 25th. invisible.

The fifth will be of the Moon, *Sept.* 9th, at 2 in the Morn, vis.& tot.

The sixth will be of the Sun, *September* the 23d. invisible.

Months.		D.	H	
January	Full moon	05	06	A
	Last quart.	12	03	A
	New moon	19	08	A
	First quart.	27	10	A
February	Full moon.	04	04	M
	Last quart.	11	02	M
	New moon	18	03	A
	First quart	26	02	A
March	Full moon.	05	03	A
	Last quart.	12	02	A
	New moon.	20	08	M
	First quart.	28	03	M
April	Full moon.	04	01	M
	Last quart.	11	02	M
	New moon	19	01	M
	First quart.	26	02	A
May	Full moon	03	09	M
	Last quart	10	03	A
	New moon	18	04	A
	First quart.	25	10	A
June	Full moon.	01	06	A
	Last quart.	09	02	M
	New moon	17	05	M
	First quart.	24	05	M

Months.		D.	H	
July	Full. moon	01	03	M
	Last quart.	08	09	A
	New moon	16	03	A
	First quart	23	00	A
	Full moon.	30	02	A
August	Last quart.	07	01	A
	New moon	14	12	A
	First quart.	21	08	A
	Full moon.	29	03	M
September	Last quart.	06	04	M
	New moon	13	09	M
	First quart.	20	06	M
	Full moon.	27	08	A
October	Last quart.	05	07	A
	New moon	12	06	A
	First quart.	19	06	A
	Full moon	27	03	A
November	Last quart.	04	07	M
	New moon	11	05	M
	First quart.	18	06	M
	Full moon	26	10	M
December	Last quart.	03	07	A
	New moon	10	04	A
	First quart.	18	02	M
	Full moon.	26	03	M

The Year 1737 *hath four Eclipses, two of the Sun and two of the Moon*

The first will be of the Sun, *Feb.* 18th, visible 11 Digits.
The second will be of the Moon *March* the 5th, invisible.
The third will be of the Sun, *August* 15th, Morning, invisible.
The fourth will be of the Moon, *Aug.* 29th, Morning vis. 5 digits.

Months.		D.	H.
January	Last quart	02	07 M
	New moon.	09	04 M
	First quart.	16	09 A
	Full moon.	24	06 A
	Last quart.	31	05 A
June	New moon	07	06 A
	First quart.	15	05 A
	Full moon.	23	08 M
March	Last quart.	02	03 M
	New moon	09	10 M
	First quart	17	10 M
	Full moon	24	05 A
	Last quart.	31	01 A
April	New moon	07	09 A
	First quart	15	12 A
	Full moon.	23	01 M
	Last quart.	29	11 A
May	New moon	07	05 A
	First quart	15	11 M
	Full moon	22	11 M
	Last quart.	29	10 M
June	New moon	06	09 M
	First quart	13	09 A
	Full moon	20	05 A
	Last quart.	27	10 A

Months.		D.	H.
July	New moon.	05	11 A
	First quart.	13	05 M
	Full moon	20	01 M
	Last quart.	27	01 A
August	New moon.	04	00 A
	First quart	11	01 A
	Full moon	18	11 M
	Last quart.	26	06 M
September.	New moon	02	11 A
	First quart.	09	09 A
	Full moon	16	11 A
	Last quart.	24	11 A
October	New moon.	02	10 M
	First quart	09	06 M
	Full moon.	16	02 A
	Last quart.	24	03 A
	New moon	31	07 A
November	First quart	07	05 A
	Full moon	15	08 M
	Last quart.	23	07 M
	New moon	30	07 M
December	First quart.	07	08 M
	Full moon	15	05 M
	Last quart.	22	08 A
	New moon	29	06 A

The Year 1738 *hath two Eclipses, both Solar.*

The first will be on *February* the 7th, invisible.
The second will be *August* 4th, visible 4 Digits.

A Table of the Moon's Age for the year 1739.

Months.		D.	H.
January	First quart.	05	06 A
	Full moon.	13	11 A
	Last quart.	21	01 A
	New moon	28	05 M
February	First quart.	04	01 A
	Full moon	12	04 A
	Last quart.	19	10 A
	New moon	26	05 A
March	First quart.	06	09 M
	Full moon	14	06 M
	Last quart.	21	05 M
	New moon	28	05 M
April	First quart	05	05 M
	Full moon	12	06 A
	Last quart.	19	11 M
	New moon	26	07 M
May	First quart.	04	10 A
	Full moon	12	02 M
	Last quart.	18	07 A
	New moon	26	09 M
June	First quart	03	01 A
	Full moon	10	09 M
	Last quart.	17	02 M
	New moon	24	12 A

Months.		D.	H.
July	First quart.	02	12 A
	Full moon	09	05 A
	Last quart.	16	noon
	New moon.	24	04 A
August	First quart.	01	09 M
	Full moon	07	12 A
	Last quart.	15	02 M
	New moon	23	07 M
	First quart.	30	05 A
September	Full moon	06	09 M
	Last quart.	13	07 A
	New moon	21	09 A
	First quart	28	12 A
October	Full moon	05	08 A
	Last quart.	13	03 A
	New moon	21	10 A
	First quart.	28	06 A
November	Full moon.	04	10 M
	Last quart.	12	noon
	New moon	19	10 M
	First quart.	26	03 A
December	Full moon	04	04 M
	Last quart.	12	08 A
	New moon	19	09 M
	First quart.	26	02 M

The Year 1739 *hath four Eclipses, two of the Sun, and two of the Moon*

The first will be of the Moon *Jan.* 13th, visible 8 Digits.
The second will be of the Sun, *Jan.* 27th, invisible.
The third will be of the Moon, *July* 9th, invisible.
The fourth will be of the Sun, *July* 29th, visible 7 dig.

Months	D	H.	
January	Full moon	02	11 A
	Laſt quart.	11	01 M
	New moon	17	08 A
	Firſt quart.	24	03 A
Febr.	Full moon	01	05 A
	Laſt quart.	09	03 A
	New moon	16	00 M
	Firſt quart	23	07 M
March	Full moon	02	Noon
	Laſt quart.	10	01 M
	New moon	16	04 M
	Firſt quart	24	01 A
April	Full moon	01	03 M
	Laſt quart.	08	08 M
	New moon	15	02 M
	Firſt quart.	22	07 A
	Full moon.	30	04 A
May	Laſt quart.	07	02 A
	New moon.	14	02 A
	Firſt quart	22	01 A
	Full moon	30	01 M
June	Laſt quart	05	07 A
	New moon	13	02 M
	Firſt quart.	21	06 M
	Full moon	28	10 M

Months.	D	H.	
July	Laſt quart.	0[illegible]	01 M
	New moon	1[illegible]	05 A
	Firſt quart	2[illegible]	08 A
	Full moon	27	05 A
Auguſt	Laſt quart.	0[illegible]	09 M
	New moon	11	08 M
	Firſt quart	19	08 M
	Full moon	25	12 M
September	Laſt quart.	01	09 A
	New moon	09	12 A
	Firſt quart	17	06 A
	Full moon.	24	09 M
October	Laſt quart.	01	Noon
	New moon	09	05 A
	Firſt quart	17	03 M
	Full moon	23	07 A
	Laſt quart	31	08 M
November	New moon	08	08 M
	Firſt quart.	15	11 M
	Full moon	22	08 M
	Laſt quart	30	05 M
December	New moon	07	11 A
	Firſt quart.	14	07 A
	Full moon.	21	12 A
	Laſt quart.	30	04 M

There will be Six Eclipſes this Year, Three of each Luminary.

The Firſt will be of the Moon, *Jan.* 2, viſible and total.
The Second will be of the Sun, *Jan.* 17, inviſible.
The Third is of the Sun, *June* 13, inviſible.
The Fourth is of the Moon, *June* 28, inviſible.
The Fifth is of the Sun, *December* 7, inviſible.
The Sixth is of the Moon, *December* 21, viſible.

Months		D.	H
January	New moon	06	Noon
	First quart.	13	04 M
	Full moon	20	06 A
	Last quart.	28	09 A
Febru.	New moon	04	11 A
	First quart.	11	03 A
	Full moon	19	Noon
	Last quart.	27	02 A
March	New moon	06	08 M
	First quart.	13	04 M
	Full moon	21	06 M
	Last quart.	29	02 M
April	New moon	04	04 A
	First quart.	11	06 A
	Full moon	19	09 A
	Last quart.	27	11 M
May	New moon	04	02 M
	First quart.	11	10 M
	Full moon	19	11 M
	Last quart.	26	05 A
June	New moon	02	10 M
	First quart.	10	04 M
	Full moon	17	11 A
	Last quart.	24	09 A

Months.		D.	H
July	New moon	01	09 A
	First quart.	09	07 A
	Full moon	17	08 M
	Last quart.	24	02 M
	New moon	31	10 M
August	First quart	08	Noon
	Full moon.	15	06 A
	Last quart.	22	08 M
	New moon.	30	01 M
September	First quart	07	04 M
	Full moon	14	01 M
	Last quart.	20	06 A
	New moon.	28	05 A
October	First quart	06	06 A
	Full moon	13	10 M
	Last quart.	20	08 M
	New moon	28	Noon
November	First quart.	05	04 M
	Full moon	11	08 A
	Last quart.	19	01 M
	New moon	27	06 M
December	First quart.	04	03 A
	Full moon	11	08 M
	Last quart.	18	10 A
	New moon	26	10 A

There will be two Eclipses this Year, both of the Sun.

The first will be on *June* 2, visible.

The second will be *November* 27, invisible.

Months		D	H.
January	First quart.	02	11 A
	Full moon	29	10 A
	Laſt quart	7	08 A
	New moon	5	noon
Febr.	First quart.	01	08 M
	Full moon	08	02 A
	Laſt quart.	16	04 A
	New moon	23	12 A
March	First quart.	02	04 A
	Full moon	10	05 M
	Laſt quart.	18	05 M
	New moon	25	09 M
April	First quart.	01	01 M
	Full moon	08	11 A
	Laſt quart.	16	11 A
	New moon	23	05 A
	First quart.	30	11 M
May	Full moon	08	03 A
	Laſt quart.	16	10 M
	New moon	23	01 M
	First quart	30	01 M
June	Full moon.	07	06 M
	Laſt quart.	14	06 A
	New moon	21	08 M
	First quart	28	04 A

Months.		D.	H.
July	Full moon	06	07 A
	Laſt quart.	13	11 A
	New moon	20	06 A
	First quart	28	10 M
auguſt	Full moon	05	06 M
	Laſt quart.	12	05 M
	New moon	19	04 M
	First quart	27	04 M
September	Full moon	03	05 A
	Laſt quart.	10	10 M
	New moon	17	06 A
	First quart	25	09 A
October	Full moon.	03	02 M
	Laſt quart.	09	06 A
	New moon	17	11 M
	First quart.	25	02 A
November	Full moon	01	Noon
	Laſt quart.	08	05 M
	New moon	16	06 M
	First quart.	24	06 M
	Full moon	30	11 P
December	Laſt quart.	07	08 A
	New moon.	16	02 M
	First quart.	23	06 A
	Full moon.	30	10 M

Four Eclipſes this Year, two of each Luminary.

The firſt is of the Moon, *May* the 8th, inviſible.
The ſecond of the Sun, *May* the 22d, inviſible.
The third is of the Moon, *November* the 1ſt, inviſible.
The fourth of the Sun, *November* the 16th, inviſible.

The Use of the foregoing Table of the Moon's Age.

IN the said Table the one half Page contains the first six Months of the Year, the other half the following six Months: in the first Column of each half, towards the Left-hand, are the Months, in the second the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the said New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A signifying Afternoon, M Morning. At the Bottom of the Tables are the Eclipses for the respective Year.

The Use of the Table is, readily by Inspection, to find the Day, Hour and Minute of the New, Full, or Quarters of the Moon.

Example. 1. Suppose it were desired to find the time of New Moon, *Jan.* 1735, First, look for the Year 1735 on the Top of the Leaf, which having found, look for *January* in the first Column towards the left-hand; then in the next Column in the same Month is found New Moon; and in the two following Columns against New Moon stands 13. 02 M which shews that the New Moon in *January* 1735 is the 13th Day at 2 Morning. The same Directions serve for the Full Moon, or first and last Quarters.

To find the *Moon's* Age, subtract the Day of the Change or New Moon from the Day proposed, the Remainder is the Moon's Age. Suppose therefore it was required to find the *Moon's* Age for *March* 27, 1735.

Looking in the Year 1735, the Table gives the New Moon for *March* to be on the 13th Day, therefore 13 being subtracted from 27, there remains 14, whereby it appears the Moon is 14 Days old on the 27th of *March* in the Year 1735.

Example. Suppose it were required to find the Moon's Age on the 19th of *November*, 1736.

The last New Moon before *Nov.* 19th, was *Octob.* 23d, but because you cannot take 23 from 19, you must add 50 (the Number of Days in *Octob.*) and from the Sum 50 subtract 23: the Remainder is the Moon's Age, required.

A Tide Table for the Sea Coasts of Great Britain, Ireland, Norway, Holland, Flanders, France, Biscay, &c. *Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, in Alphabetical Order.*

A	H	M
AT *Army*, NNE and SSW	01	30
At *Amsterdam* and *Arnenties*, NE and SW ——	03	00
At *Abarwark*, ENE. and WSW —— —— ——	04	30
At *Abermorick*, and *Antwerp*, East and West ——	06	00
At *Alborough* SE by S and NW by N —— ——	09	45
At		

B	H	M
At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, N. and S	12	00
Thwart of *Beachy* in the *Offing* N. by E. and S. by W.	12	45
At *Blackneſs* in *Bluet*, at *Bell Iſle*, NNE and SSW	01	30
Without *Bluet*, and at *Berwick*, NE by N. and SW by S.	02	15
The River of *Bourdeaux*, the South Coaſt of *Bretaigne*, the Coaſt of *Biſcay*, and at *Bockneſs*, NE and SW	03	00
At *Breſt* before the *Baſs*, the River of *Bourdeaux* within the Haven, NE by E. and SW by W.	03	45
In the *Breeſound*, *Bloy Baltimore*, ENE. WSW	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, Eaſt and Weſt	06	00
At *Briſtol* Key, E. by S. and W by N	06	45
At *Bridgwater* ESSE and W. NW	07	30
Bullen-deep, SE and NNW.	10	30
C		
In *Condado*, N and S	12	00
In the *Chamber* of *Rye*, N. by E and S by W.	12	45
Without *Calice*, at *Corpus Chriſti* Point, before and at *Camfer* NNE and SSW.	01	30
Between *Calice* and *Dover* before *Conquet*, and at the N. *Cape*, NE and SW.	03	00
At *Cork*, *Calice*, C. *Clear*, and in the *Creek*, ENE & WSW.	04	30
At *Caldy*, and in the Bay of *Camarthen*, E by N. and W by S.	05	15
At *Concalo*, Eaſt and W.	06	00
Without the *Caskets*, in the Channel SE by E. and NW. by W.	08	15
Between *Guernſey* and the *Caskets*, before *Cromer*, before the *Caskets* and *Guernſey*, at *Seven Cliffs*, and at *Catneſs*, SE. and N W.	09	00
At the *Caskets*, and at *Chamberneſs*, SE by S. and NW by N	09	
At *Cows*, in the *Foſs of Caen* in *Calice Road*, and in *Chamberneſs*, *Road*, SSE and NNW.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripplesand* and the *Creyl*, and at *Calſhot*, S by E and N by W.	11	15
D		
At *Dover Pier*, and before *Dunkirk*, North and South	12	00
At *Denbeigh* and *Downs* in the Road, NE by N & SW by S	02	15
At *Dort* NE and SW.	03	00
At *Dungervan*, E N E and W S W.	04	30
At *Dartmouth*, Eaſt and Weſt	06	00
At *Dublin*, S E by E. and NW by W.	08	15
At *Dunbar*, SE and NW.	09	00
At *Dungeneſs*, and *Dunnoſe*, S E by S and NW by N.	09	45
At *Dover*, *Diep*, and in the *Downs* a ſhoar S S E and N N W.	10	30
E		
At *Emden*, before the *Elve*, before the *Eyder*, and before *Enchuſen*, N and S.	12	00
At *Edam*, NNE and S S W.	01	30
Before the Eaſtern and Weſtern *Emes*, and at *Engomonts*, SE and NW.	09	00
F		
On the Coaſt of *Flanders*, North and South.	12	00
At *Fluſhing*, N by E, and S by W.	12	45

	H	M
Before the *Fen*, in the Channel NNE and SSW	01	30
Without *Pountney*, NE by N and SW by S	02	15
Without the Banks of *Flanders*, NE and SW	03	00
At *Flamborough* and *Bridlington*, ENE and WSW	04	30
At the *Forn*, in *Foy* at *Falmouth*, E by N and W by S.	05	15
Between *Foy* and *Falmouth*, in the Channel, and at *Foulneſs* E by S. and W by N.	06	45
Before the Coaſt of *Frizeland* and the *Fly*. ESE and WNW	07	30
Without the *Fly*, S E by E and NW by W.	08	15
At *Frize* and *Fair Iſle*, N W and S E	09	00
At the *Frith*, and at the *South Foreland*, SSE NNW	10	30
In *Fair Iſle Roads*, and at the *North Foreland*, South by Eaſt and North by Weſt	11	15
G		
In the Road of *Gibralter*, at *Graveling*, and before *Cherburg*, North and South	12	00
Before *Goeree*, at *Guernſey*, and at *Graveſend*, NNE and SSW	01	30
At *Groin* at *Gaſcoign*, and the Coaſt of *Galicia*, North Eaſt and South Weſt	03	00
Between *Guernſey* and *Caskets* SE and NW	09	00
Thwart of *Guernſey* in the Channel, SE by S. and NW by N.	09	45
In the *Chamber* and *Goereeend*, S by E and N by W	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton Key*, N. and S.	12	00
Under *Holy Iſland*, and at *Horn*, NNE and SSW	01	30
Before *Hartle-Pool*, N E and SW	03	00
At *Huntcliff-foot*, N E by E and S W by W	03	45
At *Humber* E by N & W by S.	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, Eaſt and Weſt	06	00
At *Harlem*, *Havre de Grace*, and *Homehead*, S E and N W	09	00
At St. *Hellens*, at *Harwich*, and without the Banks of *Harwich*, SSE and NNW	10	30
At *Harwich* within, S by E and N by W	11	15
I		
At *Jutland* Iſlands, N and S	12	00
On the Weſt Coaſt of *Ireland*, N E and S W	03	00
In all the Havens on the South Coaſt of *Ireland*, E by N and W by S	05	15
K		
Kentiſh Knock, N and S	12	00
At *Kelliers*, NE and SW	03	00
At *Kingſale*, ENE and WSW	04	30
At *Kilduyn*, ESE and WNW	07	30
At *Kildive*, SE and NW	09	00
L		
At *Leith*, N and S	12	00
At *Lisbon*, NE by N. and SW by S	02	15
At *London*, NE and SW	03	00
Thwart of *Londey*, and before *Lin*, E by N. and W by S	05	15
At *Lin* half Tide, at *Londey* Eaſt and Weſt	06	00
At *Lin*, E by S and W by N	06	45

At

	H	M
At the *Lizard* by the Land ESE and WNW	07	30
At *Lambay*, S E by E. and NW by W.	08	15
At *Leyſtaff*, and thwart of it without the Banks, S E by S. and NW by N.	09	45
In *Leyſtaff* Road and at *Long-ſand head*, SSE. and NNW	10	30
M		
Within the *Maes*, or *Maldon*, N by E and S by W	12	45
Before the *Maes*, NNE and SSW.	01	31
At the *Maes*, and before St. *Mathews* Point, N E by E and S W by W.	03	45
In *Mouſehole*, at St. *Mathews* and within *Mount's bay*, E N E and WSW.	04	30
In *Miiford*, or *Moonteſs*, at St. *Maloes* E by N and W by S.	05	15
Between *Mouſehole* and *Fal-mouth*, and in *Milford* Haven, ES E and W N W.	07	30
In St. *Magnes-ſouud*, and at *Magnes* Caſtle, S E by E and N by W.	08	15
At the *Iſle of Man*, SE & NW	09	00
Before *Margate* S by E. and N by W.	11	15
N		
At *Newport* half Tide N & S	12	00
At the Weſt end of the *Nore*, N by E and S by W.	12	45
Before the River of *Nantz*, N E and S W.	03	00
At *Nowcaſtle* E by N & W by S	05	15
Before St. *Nicholas*, Eaſt by South and Weſt by North.	06	45
At the *Needles*, at the Iſle of *Wight*, S E by E and NW by W	08	15
All the Coaſt of *Normandy* and *Picardy*, SSE and NNW.	10	30
Between the *Naze* and *War-head* of *Lower*, S by E & N by W	11	15
O		
At *Orkneſs*, NE and SW	03	00
At *Orkney* SE and NW	09	00
At *Orfordneſs*, S E by S and N W by N	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell Waves*, SSE and NNW.	10	30
At *Orfordneſs*, within the Sands S by E. and N by W.	11	15
P		
At *Portſmouth* Half Tide, North and South	12	01
At the *Pens*, *Porthus*, and *Poictu* NE and SW	03	00
On the Coaſt of *Portugal*, NE by E and SW by W.	03	45
In *Plymouth*, and before St *Paul's*, E by N. and W by S.	05	15
At St. *Paul's* in the Haven, Eaſt and Weſt	06	00
Before *Podeſſemeck*, E by S. and W by N.	06	45
Thwart of *Plymouth*, E S E and W N W	07	20
At the *Race of Portland*, S E and N W.	09	00
Q		
At *Quinborough*, N and S	12	00
R		
At *Rocheſter* N by E & S by W	12	45
At *Ramkins*, N N E & S S W.	01	30
Rotterdam, in *Robin-hoods* Bay, and from the Race to the *Pole-head*, NE and SW	03	00
At *Rouen*, and before Rochel, NE by E. and SW by W.	03	45
In *Romſey*, E by N & W by S	05	15
S		
In the *Sleeve* between *Uſhant* and *Scilly*, at the *Shoe*, at the		

	H	M
Spits, at *South Hampton*, and along the *Swin*, N and S	12	00
Upon the Coast of *Spain*, and in *Shetland*, NE and S W.	03	00
At *Scilly*, in the *Sound*, *Scarburgh* & at *Staples* NE by E & SW by W	03	45
At 7 *Isles*, without the Haven in the broad *Sound*, E NE and WSW.	04	30
At the mouth of *Severn* between *Scilly* & the *Lizard*, at the *Spurn* & *Stockton*, E by N and W by S	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E and W.	06	00
At *Sedmouth*, and at the *Start*, E by S and W by N.	06	45
Off the *Start* in the Channel, ESE and WNW.	07	30
Within the *Seyn*, and before *Shelbergh*, & at 7 *Clifts*, SE & NW	09	00
At *Shoram*, SE by S. & NW by N	09	45
At *Seyn head*, SSE & NNW	10	30
T		
Within *Tarvere*, W by E and S by W.	12	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE and SSW.	01	30
Before the *Tees* and *Tinmouth* before the Bay of *Tinmouth*, N E and SW.	03	00
At the *Clifts* of the *Texel*, ENE and WNW.	04	30
In *Torbay* and before the *Texel*, E and W.	06	00
In the Road of th *Texel*, E SE and WNW	07	30
At *Torgen*, SE by S and N W by N.	09	45
U		
Before *Urek*, N and S.	12	00
At *Use*, NE and SW	03	00
Between *Ushant*, and the Main, N E by E. and S W by W.	03	45

	H	M
In the *Voard*, at the Bay, within *Ushant* E N E. and WSW.	04	30
Without *Ushant*, E. and W	06	00
St. *Vallery*, S S E, and N NW.	10	30
W		
At *Winchelsey*, N by E & S. by W	12	45
At the *Wellings*, and from the W. end of the *Wight*, NNE and SSW	01	30
Before the *Wellings*. NE by N. and S W by S.	02	15
At *Whitby* NE and SW	03	00
In the Sea of *Wales* and *Severn*, ENE and WSW.	04	30
In *Wales*, *E by N* and *W by S*.	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E and W	06	00
At *Weymouth* Key, E by S and W *by* N.	06	45
At the *Ness*, by *Wieriengben*, at *Winterton*, ESE and WNW.	07	30
Thwart of the Ile of *Wight*, in the Channel, all within the *Isle of Wight*, between the *Isle of Wight* and *Beachy*, by the shore, SE by E. and NW by W.	08	15
At the E. end of the *Wight* and on *Wieringben* Flats, S E and N W.	09	00
Y		
Before *Yarmouth*, NNE and SSW.	01	30
At *Youghall*, ENE and W SW	04	30
At *Yarmouth*, SE by E and NW by W.	08	15
In *Yarmouth Road*, *Yarmouth-Haven*, SSE and NNW	10	30
Z		
On the Coast of *Zealand*, NNE and SSW.	01	00
In the *Zerick-Sea* NE and SW	03	00

THE

THE foregoing Table shews the Time of Full Sea at the several Places therein contained, upon the Full and Change Days of the Moon which for more ready Use is put in Alphabetical Order.

Example. Admit the Time of Full Sea at *London*; upon the Full and Change Days required.

Look into the Table under the Letter (L) it is found to flow at *London* North East and South West; that is when it is Full Sea at *London* the Moon, will be, as 'tis vulgarly said, upon the North East and South West Points of the Compass which, as the Compass shews, is 3 Hours.

The Use of this, together with the Moon's Southing, to find the time of Full Sea at any Time, at any of the said Places, shall be shewn below.

To find the Moon's Southing.

To find the Southing of the Moon, Multiply the Moon's Age by 4 and divide the Product by 5, and the Quotient is the Time of Southing in Hours, and the Remainder is so many 12 min. of an Hour.

Note, If the Moon's Age exceed 15, reject the said 15, and take the Remainder, with which proceed instead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppose the Time of the Moon's Southing be required on the 25th of *Novem.* 1735. The Moon's Age will be found to be 22 days, rejecting 15, the Remainder is 7; which multiplied by 4, makes 28, which divided by 5, give the Quotient 5 Hours 36 Minutes, which is the Time of the Moons Southing, which was required.

I shall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.	Time H.	M.
01 —— 16	00 ——	48
02 —— 17	01 ——	36
03 —— 18	02 ——	24
04 —— 19	03 ——	12
05 —— 20	04 ——	00
06 —— 21	04 ——	48
07 —— 22	05 ——	36
08 —— 23	06 ——	24
09 —— 24	07 ——	12
10 —— 25	08 ——	00
11 —— 26	08 ——	48
12 —— 27	09 ——	36
13 —— 28	10 ——	24
14 —— 29	11 ——	12
15 —— 30	12 ——	00

The Use of the Table.

The first and second Column shews the *Moon's* Age, the third the Southing

Example.

The Moon being 9 Days old, and her South- required.

In the first Column under the Title *Moon's Age* stands 9; over against it in the last Column is 7 Hours 12 Minutes, the Time of the Souing thing required.

Note also, the same southing serves for 24 Days old, as serves for 9 Days, as the Table shews. Thus

Thus having got the Moon's Southings, proceed to find the Time of Full Sea, as follows.

Suppose the Moon being 9 Days old, the Time of Full-Sea in the *Downs* is required.

By the foregoing Table it appears that a NNW. and SSE. Moon makes Full Sea, which, as the said Table shews, is 10 Hours 30 Minutes; to which adding the Moon's Southing at 9 Day's old, (*viz.* 7 Hours 12 Minutes,) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours in the Morning.

But to be more exact use the following Table and Directions.

Moon's Age.	Time H.	M.
01 —— 16	00 ——	43
02 —— 17	01 ——	20
03 —— 18	01 ——	52
04 —— 19	02 ——	22
05 —— 20	02 ——	52
06 —— 21	03 ——	26
07 —— 22	04 ——	07
08 —— 23	04 ——	55
09 —— 24	05 ——	50
10 —— 25	06 ——	53
11 —— 26	07 ——	59
11 —— 27	09 ——	04
13 —— 28	10 ——	08
14 —— 29	11 ——	05
15 —— 30	00 ——	00

Having found the Time of Full Sea, upon the Full and Change Days, by the preceeding Table for that Purpose, enter this Table with the Moon's Age; against which in the last Column are the Hours and Minutes to be added for the time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* is required.

A NNW. and SSE. Moon making full Sea upon the Full and Change Days, which is 10 hours 30 min. which being found, enter this Table with the Moon's Age 9 Days, against which stands 5 h. 50 min. which added to 10 h. 30 min. makes 16 hours 20 minutes, or 4 hours 20 min. (rejecting 12 Hours) in the Morning.

Here follows.

A New and Exact KALENDER,

OF

The Golden Number, Epact and Moveable Feasts; as also of the Sun's Place and Declination to every Day of the Year, for the First, Second, Third, and Leap Years, newly calculated and made to serve (without any sensible Error) till the Year 1748. *Likewise the Sun's Rising, whereby may be found the Time of Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.*

A

A Table of the Dominical Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feasts, *for* 18 *Years to come.*

Years.	Dom. Letter	Cycle ⊙	Prime	Epact	Shrove-Sunday.		Easter-Sunday.		Whit-Sunday	
1730	D	3	2	22	*February*	8	*March*	29	*May*	17
1731	C	4	3	3		28	*April*	18	*June*	6
1732	B A	5	4	14		20		9	*May*	28
1733	G	6	5	25		4	*March*	25		13
1734	F	7	6	6		24	*April*	14	*June*	2
1735	E	8	7	17	*February*	16	*April*	6	*May*	25
1736	DC	9	8	28	*March*	7		25	*June*	13
1737	B	10	9	9	*February*	20		10	*May*	29
1738	A	11	10	20		12		2		21
1739	G	12	11	1		4		22	*June*	10
1740	FE	13	12	12	*February*	17	*April*	6	*May*	25
1741	D	14	13	23		8	*March*	29		17
1742	C	15	14	4		28	*April*	18	*June*	6
1743	B	16	15	15		13		3	*May*	22
1744	AG	17	16	26		5	*March*	25		13
1745	F	18	17	17	*February*	24	*April*	14	*June*	2
1746	E	19	18	18		9	*March*	30	*May*	18
1747	D	20	19	29	*March*	1	*April*	19	*June*	7
1748	C B	21	1	11	*February*	21	*April*	10	*May*	29

Month Days	Week Days	Remarkable days, and southing of ſtars at midnight.	First Year 1733 1741				Second Year 1734 1742				Third Year 1735 1743				Leap Year 1736 1744			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		South		♈		South		♈		South		♈		South	
1	A	Circumciſion	22	22	21	37	22	07	21	40	21	52	21	42	21	38	21	44
2	B	Sun r. 8. o.	23	23	21	27	23	08	21	30	22	53	21	32	22	39	21	35
3	C		24	24	21	17	24	09	21	19	23	55	21	22	23	40	21	24
4	D		25	25	21	00	25	10	21	08	24	56	21	11	24	41	21	14
5	E		26	26	20	54	26	12	20	57	25	57	20	50	25	42	21	03
6	F	Epiphany	27	28	20	42	27	13	20	45	56	58	20	48	26	43	20	51
7	G		28	29	20	30	28	14	20	33	27	59	20	36	27	44	20	39
8	A		29	30	20	18	29	15	20	21	29	00	20	24	28	45	20	27
9	B	*Sol* in *Aqua*	♒	31	20	05	♒	16	20	08	♒	01	20	11	29	46	20	14
10	C		01	32	19	51	01	17	19	55	01	02	19	58	♒	47	20	01
11	D		02	33	19	38	02	18	19	41	02	03	19	44	01	48	19	48
12	E		03	34	19	24	03	19	19	27	03	04	19	30	02	49	19	34
13	F	Sun r. 7. 44	04	35	19	09	04	20	19	13	04	05	19	16	03	50	19	20
14	G		05	36	18	54	05	21	18	58	05	06	19	02	04	51	19	05
15	A		06	37	18	39	06	22	18	43	06	07	18	47	05	52	18	50
16	B		07	38	18	24	07	23	18	28	07	08	18	31	06	53	18	35
17	C		08	38	18	08	08	24	18	22	08	09	18	16	07	54	18	10
18	D		09	39	17	51	09	25	17	56	09	10	18	00	08	55	18	04
19	E		10	40	17	36	10	25	17	30	10	11	17	44	09	56	17	48
20	F		11	41	17	19	11	26	17	23	11	12	17	27	10	57	17	31
21	G		12	42	17	02	12	27	17	06	12	12	17	10	11	58	17	14
22	A		13	43	16	44	13	28	16	49	13	13	16	53	12	58	16	57
23	B	Sun r. 7. 30.	14	43	16	27	14	29	16	31	14	14	16	35	13	59	16	40
24	C		15	44	16	09	15	30	16	13	15	15	16	18	15	00	16	22
25	D	Co. St. *Pauls*	16	45	15	51	16	30	15	55	16	16	16	00	16	01	16	04
26	E		17	46	15	32	17	31	15	36	17	16	15	41	17	02	15	46
27	F		18	46	15	14	18	31	15	18	18	17	15	23	18	02	15	27
28	G		19	47	14	55	19	32	14	59	19	18	15	04	19	03	15	08
29	A		20	48	14	35	20	33	14	40	20	18	14	45	20	04	14	49
30	B	K. Charles M	21	48	14	16	21	34	14	21	21	19	14	25	21	04	14	30
31	C		22	49	13	56	22	34	14	01	22	20	14	06	22	05	14	11

Month Days.	Week Days.	Remarkable Days, and southing of stars at midnight.	First Year 1733 1741		Second Year 1734 1742		Third Year 1735 1743		Leap Year 1736 1744	
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♒	South	♒	South	♒	South	♒	South
1	☉	Purif. *Mary.*	23 50	13 36	23 35	13 41	23 20	13 46	23 05	13 51
2	☽	Lyon's Heart.	24 50	13 16	24 35	13 21	24 21	13 26	24 06	13 31
3	♂		25 51	12 56	25 36	13 01	25 21	13 06	25 07	13 11
4	☿		26 51	12 35	26 37	12 40	26 22	12 45	26 07	12 50
5	♃	Lyon's Neck.	27 52	12 14	27 37	12 19	27 22	12 24	27 08	12 29
6	♀	Sun r. 7. 1.	28 52	11 53	28 37	11 58	28 23	12 04	28 08	12 09
7	♄	*Sol* in *Piſces.*	29 53	11 32	29 38	11 37	29 23	11 42	29 09	11 48
8	☉		♓ 53	11 11	♓ 38	11 16	♓ 24	11 21	♓ 09	11 26
9	☽		01 53	10 49	01 39	10 55	01 24	11 00	01 09	11 05
10	♂		02 54	10 28	02 39	10 33	02 24	10 38	02 10	10 43
11	☿		03 54	10 06	03 39	10 11	03 25	10 16	03 10	10 22
12	♃		04 54	09 44	04 40	09 49	04 25	09 54	04 10	10 00
13	♀	*Valentine.*	05 55	09 22	05 40	09 27	05 25	09 32	05 11	09 38
14	♄	Sun r. 6. 45.	06 55	08 59	06 40	09 05	06 26	09 10	06 11	09 16
15	☉	Lower of the	07 55	08 37	07 40	08 42	07 26	08 48	07 11	08 53
16	☽	two foremoſt	08 55	08 14	08 40	08 20	08 26	08 25	08 11	08 31
17	♂	in □ of great	09 55	07 52	09 41	07 57	09 26	08 03	09 11	08 08
18	☿	Bear.	10 55	07 29	10 41	07 53	10 26	07 40	10 12	07 46
19	♃		11 55	07 06	11 41	07 12	11 26	07 17	11 12	07 23
20	♀		12 55	06 43	12 41	06 49	12 26	06 54	12 12	07 00
21	♄		13 55	06 20	13 41	06 26	13 26	06 31	13 12	06 37
22	☉	Sun r. 6. 29.	14 55	05 57	14 41	06 03	14 26	06 08	14 12	06 14
23	☽		15 55	05 34	15 41	05 39	15 26	05 45	15 12	05 51
24	♂	St. *Matthias.*	16 55	05 10	16 41	05 16	16 26	05 22	16 12	05 27
25	☿		17 55	04 47	17 41	04 53	17 26	04 58	17 12	05 04
26	♃		18 55	04 24	18 40	04 29	18 26	04 35	18 11	04 41
27	♀		19 55	04 00	19 40	04 06	19 26	04 12	19 11	04 17
28	♄		20 55	03 37	20 40	03 42	20 26	03 48	20 11	03 54
29	☉		When it is Leap-Year *February* hath 29 Days.						21 11	03 30

Month Days	Week Days	Remarkable days, and southing of stars at midnight.	First Year 1733 1741 ☉ pla D	M	☉ dec D	M	Second Year 1734 1742 ☉ pla D	M	☉ dec D	M	Third Year 1735 1743 ☉ pla D	M	☉ dec D	M	Leap Year 1736 1744 ☉ pla D	M	☉ dec D	M
			♓		South		♓		South		♓		South		♓		South	
1	☉ E	David	21	54	03	13	21	40	03	19	21	25	03	24	22	11	03	07
2	F	Lion's Tail.	22	54	02	49	22	40	02	55	22	25	03	01	23	10	02	43
3	G	Lower of two	23	54	02	26	23	39	02	31	23	25	02	37	24	10	02	19
4	A	latter in □ of	24	53	02	02	24	39	02	08	24	24	02	14	25	10	01	56
		Great Bear																
5	B		25	53	01	38	25	39	01	44	25	24	01	50	26	09	01	32
6	C		26	53	01	15	26	38	01	20	26	24	01	26	27	09	01	08
7	D		27	52	00	51	27	38	00	57	27	23	01	02	28	08	00	45
8	E		28	52	00	27	28	37	00	33	28	23	00	39	29	08	00	21
9	F	Sun r. 6. 0.	29	51	00	04	29	37	00	09	29	22	00	15	♈	07	Nor.	03
10	G		♈	50	Nor	20	♈	36	Nor	14	♈	22	Nor	09	01	07	00	27
11	A	Upper of two	01	50	00	44	01	36	00	38	01	21	00	32	02	06	00	50
12	B	latter in □ of	02	49	01	07	02	35	01	02	02	20	00	56	03	05	01	14
		Great Bear																
13	C		03	49	01	31	03	34	01	25	03	20	01	20	04	05	01	37
14	D		04	48	01	55	04	33	01	49	04	19	01	43	05	04	02	01
15	E		05	47	02	18	05	32	02	12	05	18	02	07	06	03	02	25
16	F		06	46	02	42	06	32	02	36	06	18	02	30	07	03	02	48
17	G	Sun r. 5. 44.	07	46	03	05	07	31	02	59	07	17	02	54	08	02	03	11
18	A		08	45	03	28	08	30	03	23	08	16	03	17	09	02	03	35
19	B		09	44	03	52	09	30	03	46	09	15	03	40	10	00	03	58
20	C		10	43	04	15	10	29	04	09	10	14	04	04	10	59	04	21
21	D	Last but two	11	42	04	38	11	28	04	33	11	13	04	27	11	58	04	44
22	E	in Great	12	41	05	01	12	27	04	56	12	12	04	50	12	57	05	07
23	F	Bears Tail	13	40	05	24	13	26	05	19	13	11	05	13	13	56	05	30
24	G	Sun r. 5. 30.	14	39	05	47	14	25	05	42	14	10	05	36	14	55	05	53
25	A	Lady-Day	15	38	06	10	15	24	06	04	15	09	05	59	15	54	06	16
26	B		16	37	06	33	16	23	06	27	16	08	06	22	16	53	06	39
27	C		17	36	06	55	17	21	06	50	17	07	06	44	17	52	07	01
28		*Virgins Spike*	18	34	07	18	18	20	07	12	18	06	07	07	18	51	07	24
29	D	Last but one	19	33	07	40	99	19	07	34	9	05	-	39	19	49	07	46
30	E	in Great	20	3.	08	02	20	18	07	57	20	04	27	5	20	48	08	08
31	F	Bears Tail	21	31	08	24	21	17	08	19	21	02	08	13	21	47	08	30

Months Days	Week Days.	Remarkable Days, and southing of stars at midnight.	First Year 1733 1741 ☉ pla	☉ dec	Scond Year 1734 1742 ☽ pla	☉ dec	Third Year 1735 1743 ☽ pla	☉ dec	Leap Year 1736 1744 ☉ pla	☉ dec
			D M	D M	D M	D M	M D	M D	D M	D M
			♈	North	♈	North	♈	North	♈	North
1	Sun	Sun r. 5. 16.	22 29	08 46	22 15	08 41	22 01	08 35	22 45	08 52
2	Mon		23 28	09 08	23 14	09 03	23 00	08 57	23 44	09 14
3	Tues		24 27	09 29	24 12	09 24	23 58	09 19	24 42	09 35
4	Wed	Last in Great *Bear's Tail.*	25 25	09 51	25 11	09 46	24 57	09 41	25 41	09 57
5	Thur		26 24	10 12	26 10	10 07	25 55	10 02	26 40	10 18
6	Fri	Sun r. 5. 6.	27 22	10 33	27 08	10 2	26 54	10 23	27 38	10 39
7	Sat		28 21	10 54	28 07	10 49	27 53	10 44	28 37	11 00
8	Sun		29 19	11 15	29 05	11 10	28 51	11 05	29 35	11 21
9	Mon		♉ 18	11 36	♉ 04	11 31	29 49	11 26	♉ 34	11 41
10	Tues		01 16	11 56	01 02	11 51	♉ 48	11 46	01 32	12 02
11	Wed	*Dragon's Tail*	02 15	12 16	02 00	12 12	01 46	12 07	02 30	12 22
12	Thur	*Arcturus.*	03 13	12 36	02 59	12 32	02 45	12 27	03 29	12 42
13	Fri		04 11	12 56	03 57	12 52	03 43	12 47	04 27	13 02
14	Sat		05 09	13 16	04 55	13 11	04 41	13 06	05 25	13 21
15	Sun		06 08	13 35	05 54	13 31	05 39	13 26	06 24	13 41
16	Mon	Sun r. 4. 48.	07 06	13 54	06 52	13 50	06 38	13 45	07 22	14 00
17	Tues		08 04	14 13	07 50	14 09	07 36	14 04	08 20	14 19
18	Wed		09 02	14 32	08 48	14 28	08 34	14 23	09 18	14 37
19	Thur		10 00	14 51	09 46	14 46	09 32	14 42	10 16	14 56
20	Fri	Southermost Scale of *Libra*	10 58	15 09	10 44	15 04	10 30	15 00	11 14	15 14
21	Sat		11 57	15 27	11 42	15 22	11 28	15 18	12 12	15 32
22	Sun	Sun r. 4. 37.	12 55	15 45	12 41	15 40	12 26	15 36	13 10	15 49
23	Mon	St. George.	13 53	16 02	13 39	15 58	13 24	15 54	14 08	16 07
24	Tues		14 51	16 19	14 37	16 15	14 22	16 11	15 06	16 24
25	Wed	St. *Mark* Ev.	15 49	16 36	15 35	16 32	15 20	16 28	16 04	16 41
26	Thur	Upper of two	16 46	16 53	16 32	16 49	16 18	16 45	17 02	16 57
27	Fri	foremost in □	17 44	17 09	17 30	17 05	17 16	17 01	18 00	17 14
28	Sat	of *Little Bear.*	18 42	17 25	18 28	17 21	18 14	17 15	18 58	17 30
29	Sun		19 40	17 41	19 26	17 32	19 12	17 33	19 56	17 45
30	Mon	N. Scale of ♎	20 38	17 57	20 24	17 53	20 10	17 49	20 54	18 01

May hath XXXI Days.

Months Days	Week's Days	Remarkable days, and sou thing of stars at midnight	First Year 1733 1741 ☉ pla		First Year 1737 1745 ☉ dec		Second Year 1734 1742 ☉ pla		Second Year 1738 1746 ☉ dec		Third Year 1735 1743 ☉ pla		Third Year 1739 1747 ☉ dec		Leap Year 1736 1744 ☽ pla		Leap Year 1740 1748 ☽ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♉		North		♉		North		♉		North		♉		North	
1	B	Phil. and Jac.	21	36	18	12	21	22	18	08	21	08	18	04	21	52	18	16
2	C	Sun r. 4 21	22	34	18	27	22	20	18	23	22	06	18	19	22	49	18	31
3	D	Brighteſt in	23	31	18	41	23	17	18	38	23	03	18	34	23	47	18	45
4	E	the Crown	24	29	18	56	24	15	18	52	24	01	18	49	24	45	18	59
5	F	Brighteſt in	25	27	19	10	25	13	19	06	24	59	19	03	25	43	19	13
6	G	Serpents neck	26	24	19	23	26	10	19	20	25	57	19	17	26	40	19	27
7	A		27	22	19	37	27	08	19	33	26	55	19	30	27	38	19	40
8	B		28	20	19	50	28	06	19	46	27	52	19	43	28	36	10	53
9	C	Scorpions	29	17	20	02	29	03	19	59	28	50	19	56	29	33	20	06
10	D	Forehead	♊	15	20	14	♊	01	20	11	29	47	20	09	♊	31	20	18
11	E	Sun r. 4. S.	01	13	20	26	00	59	20	24	♊	45	20	21	01	28	20	30
12	F		02	10	20	38	01	56	20	35	01	42	20	32	02	29	20	41
13	G	Scorpions	03	08	20	49	02	54	20	47	02	40	20	44	03	23	20	52
14	A	Heart	04	05	21	00	03	51	20	58	03	37	20	55	04	21	21	03
15	B		05	02	21	11	04	49	21	08	04	35	21	06	05	18	21	14
16	C		06	00	21	21	05	46	21	18	05	32	21	16	06	16	21	24
17	D		06	59	21	31	06	44	21	28	06	30	21	26	07	13	21	33
18	E		07	56	21	40	07	42	21	38	07	27	21	36	08	11	21	43
19	F		08	53	21	49	08	39	21	47	08	25	21	45	09	09	21	52
20	G	Sun r. 3. 57	09	50	21	58	09	36	21	56	09	22	21	54	10	06	21	00
21	A		10	47	22	06	10	33	22	04	10	20	22	02	11	03	22	08
22	B		11	45	22	14	11	31	22	12	11	17	22	10	12	01	22	16
23	C		12	42	22	22	12	29	22	20	12	14	22	18	12	58	22	24
24	D		13	40	22	29	13	26	22	27	13	12	22	25	13	56	22	31
25	E		14	37	22	36	14	23	22	34	14	09	22	32	14	54	22	37
26	F		15	34	22	42	15	20	22	41	15	07	22	39	15	50	22	44
27	G	Sun r. 3. 53.	16	32	22	48	16	18	22	47	16	04	22	45	16	47	22	50
28	A		17	29	22	54	17	16	22	52	17	01	22	51	17	45	22	55
29	B	K.C. 2 B&R.	18	26	22	59	18	13	22	58	17	58	22	57	18	42	23	00
30	C		19	23	23	04	19	10	23	02	18	56	23	02	19	39	23	05
31	D		20	20	23	08	20	07	23	07	19	53	23	06	20	36	23	09

Month Days	Week Days	Remarkable days, and southing of ſtars at midnight.	First Year 1733 1741		Second Year 1734 1742		Third Year 1735 1743		Leap Year 1736 1744			
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec		
			D M	D M	D M	D M	D M	D M	D M	D M		
			♊	North	♊	North	♊	North	♊	North		
1	E	Sun r. 3. 50.	21 18	23 12	21 04	23 11	20 50	23 10	21 34	23 13		
2	F		22 15	23 15	22 01	23 14	21 48	23 14	22 31	23 16		
3	G		23 12	23 19	22 59	23 18	22 45	23 17	23 28	23 19		
4	A		24 10	23 22	23 56	23 21	23 42	23 20	24 25	23 22		
5	B		25 07	23 24	24 53	23 23	24 39	23 23	25 23	23 24		
6	C		26 04	23 25	25 50	23 25	25 37	23 25	26 20	23 26		
7	D		27 01	23 27	26 48	23 27	26 34	23 27	27 17	23 27		
8	E		27 59	23 28	27 45	23 28	27 31	23 28	28 14	23 28		
9	F		28 56	23 29	28 42	23 29	28 28	23 28	29 12	23 29		
10	G		29 53	23 29	29 39	23 29	29 25	23 29	♋ 09	23 29		
11	A	Sun r. 3. 47.	♋ 50	23 29	♋ 36	23 29	♋ 23	23 29	01 06	23 29		
12	B		01 47	23 28	01 34	23 28	01 20	23 29	02 03	23 28		
13	C		02 45	23 27	02 31	23 28	02 17	23 28	03 00	23 27		
14	D		03 42	23 26	03 28	23 26	03 14	23 27	03 58	23 25		
15	E		04 39	23 24	04 25	23 25	04 11	23 25	04 55	23 23		
16	F		05 36	23 22	05 22	23 23	05 09	23 23	05 52	23 21		
17	G	Brighteſt in	06 33	23 19	06 20	23 20	06 06	23 21	06 49	23 18		
18	A	the Harp.	07 31	23 16	07 17	23 17	07 03	23 18	07 46	23 15		
19	B		08 28	23 13	08 14	23 14	08 00	23 14	08 44	23 12		
20	C		09 25	23 09	09 11	23 10	08 57	23 11	09 41	23 08		
21	D	Sun r. 3. 50.	10 22	23 05	10 08	23 06	09 54	23 07	10 38	23 03		
22	E		11 19	23 00	11 05	23 01	10 52	23 02	11 35	22 59		
23	F		12 16	22 55	12 03	22 56	11 49	22 57	12 32	22 53		
24	G	John Baptiſt.	13 14	22 49	13 00	22 51	12 46	22 52	13 29	22 48		
25	A		14 11	22 44	13 58	22 45	13 43	22 47	14 27	22 41		
26	B		15 08	22 37	14 55	22 39	14 40	22 40	15 24	22 36		
27	C		16 05	22 31	15 52	22 32	15 38	22 34	16 21	22 25		
28	D		17 02	22 24	16 49	22 25	16 35	22 27	17 18	22 22		
29	E	Peter Apoſtle	18 00	22 16	17 46	22 18	17 32	22 20	18 15	22 14		
30	F		18 57	22 08	18 43	22 10	18 29	22 12	19 13	22 06		

Month Days	Week Days	Remarkable days, and southing of stars at midnight.	First Year 1733 1741		Second Year 1734 1742		Third Year 1735 1743		Leap Year 1736 1744	
		☉ pla	☉ dec		☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
		D M	D M		D M	D M	D M	D M	D M	D M
		♋	North		♋	North	♋	North	♌	North
1	G	Sun r. 3. 57.	19 54	22 00	19 40	22 02	19 26	22 04	20 10	21 58
2	A		20 51	21 52	20 37	21 54	20 24	21 56	21 07	21 49
3	B		21 48	21 43	21 35	21 45	21 22	21 47	22 04	21 40
4	C		22 46	21 33	22 32	21 36	22 18	21 38	23 02	21 31
5	D	Brightest be-	23 43	21 24	23 29	21 26	23 15	21 29	23 59	21 21
6	E	tween the	24 40	21 14	24 26	21 16	24 13	21 19	24 56	21 11
7	F	Eagles should.	25 37	21 03	25 24	21 06	25 10	21 08	25 53	21 00
8	G		26 35	20 53	26 21	20 55	26 07	20 58	26 50	20 50
9	A		27 32	20 42	27 18	20 44	27 04	20 47	27 48	20 38
10	B		28 29	20 30	28 15	20 33	28 02	20 36	28 45	20 27
11	C	Sun r. 4. 8.	29 27	20 18	29 13	20 21	28 59	20 24	29 42	20 13
12	D		♌ 24	20 06	♌ 10	20 09	29 56	20 12	♌ 40	20 03
13	E		01 21	19 54	01 07	19 57	♌ 54	20 00	01 37	19 50
14	F		02 19	19 41	02 05	19 44	01 51	19 47	02 34	19 37
15	G		03 16	19 28	03 02	19 31	02 48	19 34	03 32	19 24
16	A	Sun r. 4. 16.	04 13	19 14	03 59	19 18	03 46	19 21	04 29	19 10
17	B		05 11	19 00	04 57	19 04	04 43	19 07	05 27	18 57
18	C	Swan's Tail.	06 08	18 46	05 54	18 50	05 40	18 53	06 24	18 41
19	D	Dog days beg.	07 06	18 32	06 52	18 35	06 38	18 39	07 21	18 28
20	E		08 03	18 17	07 49	18 21	07 35	18 24	08 19	18 15
21	F	Sun. r. 4. 23	09 00	18 02	08 47	18 06	08 33	18 10	09 16	17 58
22	G		09 58	17 47	09 44	17 51	09 30	17 54	10 14	17 43
23	A		10 55	17 31	10 42	17 35	10 28	17 39	11 12	17 27
24	B		11 53	17 15	11 39	17 19	11 25	17 23	12 09	17 11
25	C	James Apostle	12 50	16 59	12 37	17 02	12 23	17 07	13 06	16 55
26	D	Sun r. 4. 30.	13 48	16 43	13 34	16 47	13 20	16 51	14 04	16 38
27	E		14 46	16 26	14 32	16 30	14 18	16 34	15 01	16 22
28	F		15 43	16 09	15 29	16 13	15 15	16 17	15 59	16 05
29	G		16 41	15 52	16 27	15 56	16 13	16 00	16 56	15 47
30	A		17 38	15 39	17 24	15 39	17 10	15 43	17 54	15 30
31	B		18 36	15 17	18 22	15 21	18 08	15 25	18 52	15 14

Months Days	Weeks Days	Remarkable days, and sou thing of stars at midnight	First Year 1733 1741 ☉ pla D	M	☉ dec D	M	Second Year 1734 1742 ☉ pla D	M	☉ dec D	M	Third Year 1735 1743 ☉ pla D	M	☉ dec D	M	Leap Year 1736 1744 ☉ pla D	M	☉ dec D	M
			☊		North		☊		North		☊		North		☊		North	
1	C	Lammas	19	33	14	59	19	20	15	03	19	05	15	07	19	49	14	54
2	D		20	31	14	41	20	17	14	45	20	03	14	49	20	47	14	36
3	E		21	29	14	22	21	15	14	27	21	01	14	31	21	45	14	17
4	F		22	27	14	03	22	13	14	08	21	59	14	12	22	43	13	58
5	G		23	25	13	44	23	11	13	49	22	57	13	54	23	40	13	39
6	A		24	22	13	25	24	08	13	30	23	55	13	30	24	38	13	20
7	B	Sun r. 4. 50.	25	20	13	06	25	06	13	11	24	52	13	15	25	36	13	01
8	C		26	18	12	46	26	04	12	51	25	50	12	56	26	34	12	41
9	D		27	16	12	27	27	02	12	31	26	48	12	36	27	32	12	21
10	E		28	14	12	07	28	00	12	12	27	46	12	16	28	29	12	01
11	F		29	12	11	47	28	58	11	51	28	43	11	56	29	27	11	41
12	G	*Sol* in *Virgo*.	♍	09	11	26	29	55	11	31	29	41	11	36	♍	25	11	21
13	A		01	07	11	06	♍	53	11	12	♍	39	11	16	01	23	11	00
14	B		02	05	10	45	01	51	10	50	01	37	10	55	02	21	10	39
15	C		03	03	10	24	02	49	10	29	02	35	10	34	03	19	10	18
16	D	Sun r. 5. 8.	04	01	10	03	03	47	10	08	03	33	10	13	04	17	09	57
17	E		04	59	09	42	04	45	09	47	04	31	09	52	05	15	09	36
18	F		05	58	09	21	05	44	09	26	05	29	09	31	06	13	09	15
19	G		06	56	08	59	06	42	09	04	06	28	09	09	07	12	08	53
20	A		07	54	08	37	07	40	08	43	07	26	08	48	08	10	08	31
21	B	Fomelhaut.	08	52	08	16	08	38	08	21	08	24	08	26	09	08	08	10
22	C	Sun r. 5. 19.	09	50	07	54	09	36	07	59	09	22	08	04	10	06	07	48
23	D		10	48	07	32	10	34	07	37	10	20	07	42	11	04	07	26
24	E	Barthol. Apo	11	47	07	09	11	32	07	15	11	18	07	20	12	03	07	03
25	F	First in *Pegasus* Wing.	12	45	06	47	12	30	06	53	12	17	06	58	13	02	06	41
26	G		13	43	06	25	13	29	06	30	13	15	06	36	13	59	06	19
27	A	Sun r. 5. 29.	14	42	06	02	14	28	06	08	14	13	06	16	14	58	05	56
28	B	Dog days end	15	40	05	40	15	26	05	45	15	12	05	51	15	56	05	33
29	C	Dec. J. B.	16	38	05	17	16	24	05	22	16	10	05	28	16	54	05	11
30	D		17	37	04	54	17	23	05	00	17	09	05	05	17	53	04	48
31	E		18	36	04	38	18	21	04	37	18	07	04	42	18	51	04	25

Month Days	Week Days	Remarkable days, and southing of stars at midnight.	First Year 1733 1741				Second Year 1734 1742				Third Year 1735 1743				Leap Year 1736 1744				Year 1737 1745			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♍		North		♍		North		♍		North		♍		North		♍		North	
1	F	Sun r. 5. 38.	19	34	04	08	19	20	04	14	19	06	04	19	19	50	04	02	19	33	04	08
2	G	*Lond* burnt 66	20	32	03	45	20	18	03	51	20	04	03	50	20	48	03	39	20	31	03	45
3	A		21	31	03	22	21	17	03	28	21	03	03	32	21	47	03	16	21	31	03	22
4	B		22	30	02	59	22	15	03	05	22	02	03	10	22	46	02	53	22	30	02	59
5	C		23	28	02	36	23	14	02	41	23	00	02	47	23	45	02	29	23	28	02	36
6	D		24	27	02	13	24	13	02	18	23	59	02	24	24	43	02	06	24	27	02	13
7	E		25	26	01	49	25	11	01	55	24	57	02	01	25	42	01	43	25	26	01	49
8	F		26	24	01	26	26	10	01	32	25	56	01	38	26	40	01	19	26	24	01	26
9	G		27	23	01	02	27	09	01	08	26	55	01	14	27	39	00	56	27	23	01	02
10	A		28	22	00	39	28	08	00	45	27	53	00	50	28	38	00	33	28	22	00	39
11	B	*Androm. Head*	29	21	00	16	29	07	00	21	28	52	00	27	29	37	00	09	29	21	00	16
12	C	Sun r. 6, 0.	♎	20	Sou	08.	♎	05	Sou.	02	29	51	00	04	♎	35	Sou.	14	♎	20	Sou	08.
13	D		01	19	00	31	01	04	00	26	♎	50	Sou.	20	01	55	00	38	01	19	00	31
14	E		02	18	00	55	02	03	00	49	01	49	00	42	02	34	01	01	02	18	00	55
15	F	End of Pega-	03	17	01	18	03	02	01	13	02	48	01	07	03	33	01	25	03	17	01	18
16	G	sus Wing.	04	16	01	42	04	01	01	36	03	47	01	35	04	32	01	48	04	16	01	42
17	A		05	15	02	05	05	00	02	00	04	46	01	54	05	31	02	12	05	15	02	05
18	B		06	14	02	29	05	59	02	23	05	45	02	17	06	30	02	35	06	14	02	29
19	C		07	13	02	52	06	58	02	46	06	44	02	41	07	29	02	59	07	13	02	52
20	D	Sun r 6. 16.	08	12	03	15	07	58	03	10	07	43	03	04	08	28	03	22	08	12	03	15
21	E	Matthew Ev.	09	11	03	39	08	57	03	33	08	42	03	28	09	27	03	45	09	11	03	39
22	F		10	10	04	02	09	56	03	56	09	42	03	51	10	26	04	08	10	10	04	02
23	G	Pole Star	11	10	04	25	10	55	04	20	10	41	04	14	11	26	04	32	11	10	04	25
24	A		12	09	04	49	11	54	04	43	11	40	04	37	12	25	04	55	12	09	04	49
25	B	Southermost	13	08	05	12	12	54	05	06	12	39	05	01	13	24	05	18	13	08	05	12
26	C	in *Androme-*	14	08	05	35	13	53	05	29	13	39	05	24	14	24	05	41	14	08	05	35
27	D	*da's* Girdle.	15	07	05	58	14	52	05	52	14	38	05	47	15	23	06	04	15	07	05	58
28	E		16	06	06	21	15	52	06	15	15	38	06	10	16	23	06	27	16	06	06	21
29	F	Sun r. 6. 30	17	06	06	44	16	51	06	38	16	37	06	33	17	22	06	51	17	06	06	44
30	G		18	05	07	06	17	51	07	01	17	36	06	55	18	21	07	15	18	05	07	06

Month Days	Week Days	Remarkable days, and southing of Stars at midnight.	First Year 1733 1741				Second Year 1734 1742				Third Year 1735 1743				Leap Year 1736 1744			
			☽ pla		☉ dec		☉ pla		☽ dec		☉ pla		☽ dec		☽ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♏		South		♏		South		♏		South		♏		South	
1	A	Sun r. 6. 38	19	05	07	29	18	50	07	23	18	36	07	18	19	20	07	35
2	B		20	04	07	52	19	50	07	46	19	35	07	41	20	20	07	58
3	C		21	04	08	14	20	49	08	08	20	35	08	03	21	20	08	20
4	D		22	04	08	37	21	49	08	31	21	35	08	26	22	20	08	43
5	E		23	03	08	59	22	49	08	53	22	34	08	48	23	20	09	05
6	F		24	03	09	21	23	48	09	15	23	34	09	10	24	19	09	27
7	G		25	03	09	43	24	48	09	37	24	34	09	32	25	19	09	49
8	A		26	02	10	04	25	48	09	59	25	33	09	54	26	19	10	10
9	B		27	02	10	26	26	48	10	21	26	33	10	16	27	19	10	32
10	C	*Andromeda's*	28	02	10	48	27	48	10	43	27	33	10	37	28	18	10	54
11	D	southermost	29	02	11	09	28	47	11	04	28	33	10	59	29	18	11	15
12	E	Foot.	♐	02	11	30	29	47	11	25	29	33	11	20	♑	18	11	36
13	F	Sun r. 7. 4.	01	02	11	51	♏	47	11	46	♏	33	11	41	01	18	11	57
14	G		02	02	12	12	01	47	12	07	01	33	12	02	02	18	12	18
15	A		03	02	12	33	02	47	12	28	02	33	12	23	03	18	12	38
16	B		04	02	12	53	03	47	12	48	03	33	12	43	04	18	12	59
17	C		05	02	13	13	04	47	13	09	04	33	13	04	05	18	13	19
18	D	*Luke* Evan.	06	02	13	33	05	47	13	28	05	33	13	24	06	18	13	39
19	E		07	02	13	53	06	47	13	48	06	33	13	44	07	18	13	59
20	F		08	02	14	13	07	48	14	08	07	33	14	03	08	19	14	18
21	G		09	02	14	32	08	48	14	27	08	33	14	23	09	19	14	37
22	A		10	03	14	52	09	48	14	47	09	33	14	42	10	19	14	56
23	B		11	03	15	10	10	48	15	06	10	34	15	01	11	19	15	15
24	C		12	03	15	29	11	48	15	24	11	34	15	20	12	19	15	34
25	D	Sun r. 7. 24	13	03	15	47	12	49	15	43	12	34	15	38	13	20	15	52
26	E		14	04	16	05	13	49	16	01	13	34	15	57	14	20	16	10
27	F		15	04	16	22	14	49	16	19	14	35	16	15	15	20	16	28
28	G	*Simon* & *Jude*	16	04	16	41	15	50	16	37	15	35	16	32	16	21	16	45
29	A		17	05	16	58	16	50	16	54	16	36	13	50	17	21	17	03
30	B		18	05	17	15	17	51	17	11	17	36	17	07	18	22	17	20
31	C	Sun r. 7. 33.	19	06	17	32	18	51	17	28	18	36	17	24	19	22	17	36

Months Days	Weeks Days	Remarkable days, and southing of stars at midnight	First 1733 1741 ☉ pla		☽ dec		Year 1737 1745 Second 1734 1742 ☉ pla		☉ dec		Year 1738 1746 Third 1735 1743 ☉ pla		☉ dec		Year 1739 1747 Leap 1736 1744 ☽ pla		☉ dec		Year 1740 1748
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	
			♏		South		♏		South		♏		South		♏		South		
1	☉	All Saints	20	06	17	48	19	52	17	44	19	37	17	40	20	23	17	53	
2	E	Sun r. 7. 36.	21	07	18	04	20	52	18	00	20	37	17	56	21	23	18	08	
3	F		22	07	18	20	21	53	18	16	21	38	18	12	22	24	18	24	
4	G	K. *W.* Nat.	23	08	18	35	22	53	18	32	22	38	18	28	23	24	18	40	
5	A	Powder Plot	24	08	18	51	23	54	18	47	23	39	18	43	24	25	18	55	
6	B		25	09	19	05	24	54	19	02	24	40	18	58	25	26	19	09	
7	C		26	10	19	20	25	55	19	16	25	40	19	13	26	26	19	24	
8	D		27	10	19	34	26	56	19	30	26	41	19	27	27	27	19	38	
9	E		28	11	19	48	27	56	19	44	27	42	19	41	28	28	19	51	
10	F		29	12	20	01	28	57	19	58	28	42	19	54	29	28	20	05	
11	G	*Martin* B.	♐	13	20	14	29	58	20	11	29	43	20	08	♑	29	20	19	
12	A		01	13	20	27	♐	59	20	24	♐	44	20	20	01	30	20	32	
13	B	Sun r. 7. 53.	02	14	20	39	01	59	20	36	01	45	20	33	02	31	20	42	
14	C		03	15	20	51	03	00	20	48	02	45	20	45	03	31	20	54	
15	D		04	16	21	02	04	01	20	59	03	46	20	57	04	32	21	05	
16	E	*Aldebaran*	05	17	21	13	05	02	21	11	04	47	21	08	05	33	21	16	
17	F		06	17	21	24	06	03	21	21	05	48	21	19	06	34	21	27	
18	G		07	18	21	34	07	04	21	32	06	49	21	29	07	35	21	37	
19	A		08	19	21	44	08	04	21	42	07	50	21	39	08	36	21	47	
20	B		09	20	21	53	09	05	21	51	08	51	21	49	09	37	21	56	
21	C		10	21	22	03	10	06	22	00	09	52	21	58	10	38	22	05	
22	D		11	22	22	11	11	07	22	09	10	52	22	07	11	39	22	13	
23	E		12	23	22	19	12	08	22	17	11	53	22	15	12	40	22	21	
24	F	Sun r. 8. 5.	13	24	22	27	13	09	22	25	12	54	22	23	13	41	22	29	
25	G	*Capella*, or	14	25	22	34	14	10	22	33	13	55	22	31	14	42	22	36	
26	A	the Goat.	15	26	22	41	15	11	22	40	14	56	22	38	15	43	22	43	
27	B	*Orion*'s Left	16	27	22	48	16	12	22	46	15	58	22	45	16	44	22	49	
28	C	Foot.	17	28	22	54	17	13	22	52	16	59	22	51	17	45	22	55	
29	D	Bull's Horn	18	29	22	59	18	14	22	58	18	00	22	56	18	46	23	00	
30	E	*Andrew* Ap.	19	30	23	04	19	15	23	03	19	01	23	02	19	47	23	05	

Month Days	Week Days	Remarkable days, and southing of ſtars at midnight	First Year 1733 1741 ☽ pla		☉ dec		Second Year 1734 1742 ☽ pla		☉ dec		Third Year 1735 1743 ☽ pla		☉ dec		Leap Year 1736 1744 ☽ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♐		South		♐		South		♐		South		♐		South	
1	✠	First in *Orion's* Belt.	20	31	23	09	20	17	23	08	20	02	23	06	20	48	23	10
2	A		21	32	23	13	21	18	23	12	21	03	23	11	21	49	23	14
3	B	Laſt in *Orion's* Belt	22	34	23	16	22	19	23	16	22	04	23	15	22	50	23	27
4	C		23	35	23	20	23	20	23	19	23	05	23	18	23	51	23	20
5	D	*Orion's* right	24	36	23	22	24	21	23	22	24	06	23	21	24	52	23	23
6	E	ſhoulder, and	25	37	23	25	25	22	23	24	25	07	23	24	25	54	23	25
7	F	*Auriga's*	26	38	23	26	26	23	23	26	26	08	23	26	26	55	23	27
8	G	right ſhould.	27	39	23	28	27	24	23	27	27	10	23	27	27	56	23	28
9	A		28	41	23	29	28	26	23	28	28	11	23	28	28	57	23	29
10	B		29	42	23	29	29	27	23	29	29	12	23	29	29	58	23	29
11	C	Shorteſt Day	♑	43	23	29	♑	28	23	29	♑	13	23	29	♑	59	23	29
12	D		01	44	23	28	01	29	23	28	01	14	23	29	02	00	23	28
13	E	Foot of the	02	45	23	27	02	30	23	28	02	15	23	28	03	02	23	27
14	F	great Dog.	03	46	23	26	03	31	23	26	03	16	23	27	04	03	23	25
15	G	Bright Foot	04	48	23	24	04	33	23	24	04	18	23	25	05	04	23	23
16	A	of *Gemini.*	05	49	23	21	05	34	23	22	05	19	23	23	06	05	23	21
17	B	Sun r. 8. 11.	06	50	23	18	06	35	23	19	06	20	23	20	07	06	23	18
18	C	Mouth of the	07	51	23	15	07	36	23	16	07	21	23	17	08	08	23	14
19	D	great Dog, or	08	52	23	11	08	37	23	12	08	22	23	13	09	09	23	10
20	E	*Syrius.*	09	53	23	07	09	38	23	08	09	24	23	09	10	10	23	06
21	F	*Thomas* Ap.	10	54	23	02	10	40	23	03	10	25	23	04	11	11	23	01
22	G		11	56	22	57	11	41	22	58	11	26	22	59	12	12	22	55
23	A	Sun r. 8. 8.	12	57	22	51	12	42	22	53	12	27	22	54	13	13	22	49
24	B		13	58	22	45	13	43	22	47	13	28	22	48	14	15	22	43
25	C	Nat. *Chriſt.*	14	59	22	38	14	44	22	40	14	29	22	42	15	16	22	37
26	D	St. *Stepen.*	16	00	22	31	15	45	22	33	15	31	22	35	16	17	22	29
27	E	*John* Evan.	17	01	22	24	16	47	22	26	16	32	22	28	17	18	22	22
28	F	*Innocents.*	18	03	22	16	17	48	22	18	17	33	22	20	18	19	22	14
29	G	Caſtor.	19	04	22	08	18	49	22	10	18	34	22	12	19	20	22	05
30	A	Pollux.	20	05	21	59	19	50	22	06	19	33	22	03	20	22	21	56
31	B	Sun r. 8. 1.	21	06	21	49	20	51	21	52	20	36	21	54	21	23	21	47

A Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of *London*.

Degrees of Longitude from the Meridian of London.

Daily Variat. Min.	Deg. 15 Min.	Deg. 30 Min.	Deg. 45 Min.	Deg. 60 Min.	Deg. 75 Min.	Deg. 90 Min.	Deg. 105 Min.	Deg. 120 Min.	Deg. 135 Min.	Deg. 150 Min.	Deg. 165 Min.	Deg 180 Min
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is 11 Columns; the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, *&c.* the third the Southing of ſeveral Stars at Midnight, at which time the ſaid Stars are to be obſerved, thereby to find the Latitude; in the ſame Column is given the time of Sun Riſing (and ſubtracting the time of Riſing from 12 Hours, gives the time of ſetting) the eight following Columns ſhews the Sun's Place and Declination for the Firſt, ſecond, Third, and Leap Year, according to their reſpective Titles.

For the more ready knowing of Leap Year, the following Table is inſerted where it is found by Inſpection, as alſo follow the Firſt, Second, or Third Years after Leap Year.

Firſt Year	Second Year.	Third Year	Leap-Year
1729	1730	1731	1732
1733	1734	1735	1736
1737	1738	1739	1740
1741	1742	1743	1744
1745	1746	1747	1748
1749	1750	1751	1752
1753	1754	1755	1756
1757	1758	1759	1760

The Uſe of the Kalendar.

To find the Day of the Week, or Month, for any Time paſt or to come, by the Kalendar.

Firſt, find the dominical Letter for the Year, then proceed as follows.

Example 1. Suppoſe it was required to find what Day of the Month will be the third Wedneſday in *March*, 1739.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be G, turn to the Month of *March*, and account G for Sunday, then the Letter C is for Wedneſday, and the third Wedneſday is the 21ſt of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1736.

This Year being Leap Year has two Dominical Letters D and C the firſt Letter, to wit D, ſerving from the firſt of *January* to the end of *February*, the laſt Letter, to wit C, ſerves from thence to the Years end.

Wherefore looking againſt the ſecond of *September*, there ſtands G, which repreſents *Thurſday*, the day of the Week required.

Note, That the *Gregorian* or *Foreign* Account, begins 11 Days before ours, ſo that our firſt of *January* is their 12th, our 12th their 23d, our 23d, their 3d of *February*, our 24th of *February* is their 7th of *March*, but in Leap Year, our 24th of *February* is their 6th of March, becauſe then *February* hath 29 Days.

To

To find the Sun's Place and Declination by the Kalendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January*, 1733. being the firſt after Leap Year.

In the Month of *January*, in the firſt Column look the Day of the Month, over againſt which, under the firſt Year ſtands 1.32. that is, the Sun's Place is in 1 deg. 32 min. of *Aquaries*; in the next Column under the ſaid Year ſtands 19 51, under the Title South, which ſhews the Declination to be 19. deg. 51 min. Southerly; and this ſerves for the Year 1733: on the ſaid 10th of *January*, being the firſt after Leap Year.

Example 2. Suppoſe the Sun's Place and Declination to be required on the 10th of *March*, 1736, being Leap Year.

In the Month of *March*, in the firſt Column find the Day of the Month, over againſt which under Leap Year ſtands 1.07. which ſhews the Sun's Place to be in 1 deg. 07 min. of *Aries*; and in the next Column under Leap Year ſtands 00.27, which ſhews the Declination to be 27 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalender, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Kalender it is calculated to the Meridian of *London*, for which end the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Kalendar is added; the Uſe and Explanation whereof follows.

IN the firſt Column is the Daily Variation, which is found by ſubtracting the Declination of the given Day of the Month, from the Declination for the Day following; or contrarily this from that, that is the leſſer from the greater, and the Difference is the Daily Variation. In the head of the other Columns are Degrees of Longitude from *London*, either Eaſterly or Weſterly, and in thoſe Columns under the reſpective deg. of Longitude, are the Minutes of Declination, anſwerable to the daily Variation. As Suppoſe the daily Variation were 10 min. and the Difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the head of the Table, ſtands 2 Minutes, which anſwers thereto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declination

The Rule. Firſt, If the Difference of Longitude be Weſterly, and the Declination increaſing, the Variation found in this Table muſt be added to the Declination found in the Kalender; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, If the Difference of Longitude be Eaſterly, and the Declination increaſing, the Variation aforeſaid muſt be ſubtracted; but the Declination decreaſing muſt be added.

Example 1. *April* the 19th, 1736, being at Sea, the Difference of Longitude from the Meridian of *London*, being 90 degrees Weſterly, I find the Decli-

Declination in the Kalender to be 14 deg. 56 min. North; and the 20th Day, the Declination is 15 deg. 14 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 18 min. which is the daily increaſe. Then in the Table under 90 deg. and over againſt 18 ſtands 4 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 14 deg. 56 min. before found, which makes the true Declination 15 deg. 00 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 4 min. found in the Table muſt have been ſubtracted.

Note. It is eaſily diſcerned whether the Declination increaſe or decreaſe, by obſerving whether the Declination for the Day following be greater or leſſer; for if it be greater, then it increaſes; but if leſs, then it decreaſes.

Examp 2. *January* the 10th, 1733, being at Sea, the Difference of Longitude from *London* being 120 deg. Weſterly, I find the Declination in the Kalender to be 19 deg. 51. min. South, and the 11th Day it is 19 deg. 38 min. therefore ſubtracting the leſſer from the greater, the Difference is 13 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 13 ſtands 4 min. which (becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 19 deg. 47 min. South. If the Difference of Longitude had been Eaſterly, the 4 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Declination of the Sun is moſt uſeful at Sea, with the Complement of the Sun's Meridian Altitude (commonly called the *Zenith Diſtance*) taken with a Quadrant or Croſs Staff, to find the Latitude of the Place, for which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude North.

Example. Suppoſe being at Sea, the 10th of *April*, 1736, the Declination found by the Table is 12 deg. 02 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

	°	′	
Complement of the Meridian Altitude is—	23	10	South.
Declination of the Sun is————————	12	02	North
The Latitude of the Place is ——— ——	35	12	North.

Rule 2. If the Sun comes to the Meridian in the North and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe being at Sea *May* 20th, 1736, the Declination of 22 deg. 00 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant the Sun's Zenith Diſtance is 18d. 42 m. what is the Latitude of the Place?

Decli-

Sun's Declination is	22° 00′ North
Sun's Zenith Diſtance	18 42 North
The Latitude is	3 18 North

Example 2. Suppoſe being at Sea, *June* 10th, 1737, the Sun's Declination by the Table is 23 deg, 29 min. North. the Complement of the Meridian Altitude, by Obſervation is 33 deg. 10 min. the Sun comes to the Meridian in the North?

Sun's Complement Meridian Altitude is	33° 10′ North
Sun's Declination	23 29 North
The Latitude is	9 41 South

Rule 3. If the Sun comes to the Meridian in the North, and have South Declination, the Declination added to the Complement of the Altitude, is the Latitude South.

Example. Suppoſe being at Sea, *January* the 29th, 1736: the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude, is 22 deg. 10 min. What is the Latitude?

Complement Sun's Meridian Altitude is	22° 10′ North
Sun's Declination by the Table	14 49 South
The Latitude is	36 59 South

Rule 4. If the Sun comes to Meridian in the South, and have South Declination, ſubtract the Complement of the Meridian Altitude, from the Declination, the Remainder is the Latitude South. But if the Complement of the Meridian Altitude exceed the Declination ſubtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. Suppoſe being at Sea, *January* 1ſt, 1736, the Sun coming to the Meridian in the South. The Complement of the Altitude is 10 deg. 36 min. What is the Latitude?

	°	′	
Sun's Declination	21	44	South.
Complement Meridian Altitude	10	36	South.
Latitude of the Place	11	08	South

Example 2. Suppoſe being at Sea, *February* 18th, 1734, the Sun coming to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

	°	′	
Complement Sun's Meridian Altitude is	25	20	South
Sun's Declination	07	35	South
Latitude	17	49	North

Rule 5. If the Sun be in the Zenith (that is right over head) if it have either North or South Declination, the Declination is the Latitude either North or South.

Rule 6. If the Sun have no Declination, the Complement of the Meridian Altitude is the Latitude which is North or South, according as the Ship is to the Northward or Southward of the Equinoctial.

A

Days.	*Januar.* ☉ Right Ascension		*Febru.* ☉ Rigt Ascension		*March.* ☉ Right Ascension		*Apr.* ☉ Right Ascension		*May* ☉ Right Ascension		*June.* ☉ Right Ascension	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
1	19	36	21	43	23	29	01	22	03	15	05	20
2	19	40	21	47	23	33	01	26	03	19	05	24
3	19	44	21	51	23	37	01	30	03	23	05	28
4	19	49	21	55	23	40	01	34	03	27	05	32
5	19	53	21	59	23	44	01	37	03	31	05	37
6	19	57	22	03	23	47	01	41	03	35	05	41
7	20	01	22	07	23	51	01	45	03	39	05	45
8	20	05	22	11	23	54	01	48	03	44	05	49
9	20	09	22	15	23	58	01	52	03	47	05	53
10	20	14	22	18	00	02	01	55	03	51	05	57
11	20	18	22	22	00	06	01	59	03	55	06	01
12	20	23	22	26	00	09	02	03	03	59	06	05
13	20	27	22	30	00	13	02	07	04	03	06	09
14	20	31	22	34	00	16	02	11	04	07	06	13
15	20	35	22	37	00	20	02	14	04	11	06	18
16	20	39	22	41	00	24	02	18	04	15	06	22
17	20	43	22	45	00	27	02	22	04	19	06	27
18	20	47	22	49	00	31	02	26	04	23	06	30
19	20	51	22	53	00	34	02	30	04	27	06	34
20	20	55	22	56	00	38	02	33	04	31	06	39
21	20	59	23	00	00	42	02	37	04	35	06	42
22	21	04	23	04	00	45	02	41	04	39	06	47
23	21	08	23	07	00	49	02	45	04	43	06	51
22	21	12	23	11	00	53	02	49	04	47	06	55
25	21	16	23	15	00	56	02	52	04	51	06	59
26	21	20	23	18	01	00	02	56	04	55	07	03
27	21	24	23	22	01	04	03	00	04	59	07	07
28	21	28	23	26	01	07	03	04	05	03	07	11
29	21	32			01	11	03	08	05	07	07	15
30	21	36			01	15	03	11	05	12	07	20
31	21	39			01	18			05	16		

Days.	*July.* ☉ Right Ascension		*August* ☉ Right Ascension		*Septem.* ☉ Right Ascension		*October.* ☉ Right Ascension		*Novem* ☉ Right Ascension		*Decemb* ☉ Right Ascension	
	H.	M.	H.	M.	H.	M	H.	M.	H.	M.	H.	M
1	07	24	09	26	11	20	13	09	15	08	17	16
2	07	28	09	30	11	24	13	13	15	12	17	21
3	07	32	09	34	11	27	13	16	15	16	17	26
4	07	36	09	38	11	31	13	20	15	20	17	30
5	07	40	09	40	11	34	13	23	15	24	17	35
6	07	44	09	45	11	37	13	27	15	28	17	39
7	07	48	09	49	11	42	13	31	15	32	17	43
8	07	52	09	52	11	45	13	35	15	37	17	47
9	07	56	09	56	11	49	13	39	15	41	17	52
10	08	00	09	59	11	50	13	42	15	46	17	57
11	08	04	10	03	11	56	13	46	15	50	18	01
12	08	08	10	07	12	00	13	50	15	54	18	06
13	08	12	10	11	12	03	13	54	15	59	18	10
14	08	16	10	15	12	07	13	58	16	03	18	15
15	08	20	10	18	12	10	14	01	16	08	18	20
16	08	24	10	22	12	14	14	05	16	12	18	24
17	08	28	10	26	12	18	14	09	16	16	18	29
18	08	32	10	29	12	21	14	13	16	20	18	34
19	08	36	10	33	12	25	14	17	16	24	18	38
20	08	40	10	36	12	28	14	21	16	29	18	42
21	08	44	10	40	12	32	14	25	16	33	18	46
22	08	48	10	44	12	36	14	29	16	37	18	50
23	08	52	10	48	12	39	14	33	16	41	18	55
24	08	56	10	51	12	43	14	37	16	45	18	59
25	08	59	10	54	12	46	14	40	16	50	19	04
26	09	03	10	58	12	50	14	44	16	54	19	08
27	09	07	11	02	12	54	14	48	16	58	19	12
28	09	11	11	05	12	58	14	52	17	03	19	17
29	09	15	11	09	13	02	14	56	17	07	19	21
30	09	18	11	12	13	06	15	00	17	12	19	26
31	09	22	11	16			15	04			19	31

A Table shewing the Right Ascension, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnitude.	Right Ascens. H.	Right Ascens. M.	Declination. H.	Declination. M.	
Pole Star	2	00	32	87	51	N
Girdle of Andromeda	2	00	50	33	50	N
Bright Star of Aries	2	01	52	22	10	N
Medusa's Head	2	02	49	39	54	N
Right side of Perseus	2	03	05	48	52	N
Aldebaran, or Bull's Eye	1	04	18	15	55	N
Capella, or the Goat	1	04	55	45	41	N
Bright Foot of Orion	1	05	01	08	33	S
Middle Star in Orion's Belt	3	05	20	01	25	S
Orion's Right Shoulder	1	05	39	07	19	N
Auriga's Right Shoulder	2	05	44	44	53	N
Bright Foot of Gemini	2	06	19	16	38	N
Syrius, or the Great Dog	1	06	33	16	21	S
Castor, or Northermost Twin	2	07	16	32	27	N
Procyon, or the Little Dog	2	07	24	05	54	N
Pollux, or Southermost Twin	2	07	25	28	39	N
Hydra's Heart	1	09	14	07	29	S
Lyon's Heart, or Regulus	1	09	54	13	16	N
The Lower of the Pointers	2	10	41	57	50	N
The Upper of the Pointers	2	10	43	63	13	N
Lyon's Tail	1	11	31	16	05	N
Upper of Two last in the Square of the Great Bear	2	12	02	58	34	N
Last but two in the Great Bear's Tail	2	12	40	57	27	N
Virgins Spike	1	13	11	09	44	S
Last but one in the Great Bear's Tail	2	13	10	56	21	N
Last in the Great Bear's Tail	2	13	34	50	42	N
Arcturus	1	14	02	20	38	N
South Ballance	2	14	32	14	54	S
Foremost Guard	2	14	51	75	15	N
Brightest of the Crown	2	15	21	25	38	N
Brightest of the Serpent's Neck	2	15	33	07	18	N

Antares

Antares, the Scorpion's Heart	1	16	12	25	47	S
Head of Hercules	3	17	02	14	43	N
Ophincus, or Serpent's Head	3	17	22	12	47	N
Lyra, or the Harp	1	18	27	38	33	N
Swan's Bill	3	19	17	27	29	N
Vulture, or Eagle's Heart	2	19	34	08	10	N
Swan's Tail.	2	20	30	44	19	N
Mouth of Pegasus	3	21	27	08	39	N
Fomelhaut	1	22	41	31	03	S
Marchab, or Pegasus Wing	2	22	48	13	44	N
Scheat, or Pegasus Leg	2	22	50	26	36	N
Cephus's Knee	3	23	20	76	07	N
Andromeda's Head	2	23	53	27	35	N
End of Pegasus Wing	2	25	57	13	39	N

The Explanation and Use of the TABLE *of the Sun's Right Ascension; and of the Table of the Star's Right Ascension and Declination.*

IN the Table of the Sun's Right Ascension, the first Page contains the first six Months of the Year; the next Page the other six Months. At the Head of the Table are the Months; in the first Column towards the Left-hand are the Days of the Month, and in the opposite Column is the Right Ascension in Hours and Minutes.

In the Table of the *Fixed Stars*, there are four Columns; in the first towards the Left hand, are the Names of the Stars; in the second, the Star's Magnitude; in the Third, the Right Ascension in Hours and Minutes; in the Fourth, their Declination in Degrees and Minutes, North or South.

First, to find the time of the Stars coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 hours, and then subtract; the Remainder after subtraction, is the time of the Stars coming upon the Meridian from Noon: But if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the time that *Fomelhaut* comes upon the Meridian on the 10th of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 41 min. and the Sun's to be 13 deg. 42 min. which subtracted from the Star's Right Ascension, leave 8 Hours 59 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* were required.

I find the Star's Right Ascension to be 4 Hours 18m. the Sun's 14 hours 1 min. Now because the Sun's Right Ascension is more than the Stars, add

to

to the Star's Right Aſcenſion 24 hours, which makes 28 hours 18 min. from which ſubtracting the Sun's Right Aſcenſion 14 hours 1 min. there remains 14 hours 17 min. from which ſubtracting 12 hours, there remains 2 hours 17 min. which is the time of the Star's Southing after Midnight as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the ſame time.

The Rule. To the Sun's Right Aſcenſion add the time from Noon, at which the Star's coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the Star that will come to the Meridian at that time; with which enter the Table of the Star's Right Aſcenſion and Declination, where look what Stars Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *March* 27th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 hour 4 Minutes: the time from Noon is 8 hours, which is added to the Sun's Right Aſcenſion, makes 9 hours, 4 minutes: the neareſt in the Table is *Hydra's Heart*, whoſe Right Aſcenſion is 9 hours 14 minutes, and therefore Souths at 8 hours 8 minutes, and ſo in others.

Directions for Obſervations of the Stars, to find the Latitude of the Place.

Having before ſhewn how to find the Time of a Star's coming to the Meridian, I ſhall now ſhew by the Star's Altitude, how to find the Latitude.

Note, In North Latitude, thoſe Star's whoſe North Declination exceed the Complement of the Latitude may be obſerved under the Pole. And the ſame may be performed by the ſouthern Stars in South Latitude.

Directions for finding the Latitude, by the Meridional Altitude of the fix'd Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Altitude (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination gives the Latitude North.

Example. On the 10*th* of *Jauuary*, being at Sea, I find by the foregoing Directions, that the *Lyon's Heart* comes to the Meridian in the South at 1 hour, 37 min. after Midnight, the Meridian Altitude by Obſervation was 63 Degrees; which ſubtracted from 90 Degrees, there remains 27 Degrees the Complement of the Altitude; to which adding 13 Degrees 16 minutes the Declination of the Star North, gives 40 Degrees 16 Minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and have South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North. But if the Declination exceed

the

the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 10th of *July*, being at Sea, the *Star Fomelhaut* coming to the Meridian in the *South*, at 2 hours 41 m. after Midnight, the *Merid. Alt.* 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Stars Declination is 31 deg. 03 min. *South*, which ſubtracted from the Compl. of *Alt.* leaves 23 deg. 07 min. which is the Latitude North.

Example 2. Suppoſe on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 hours 33 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 degrees 46 minutes South; from which ſubtracting the Complement of the Altitude there remains 20 deg. 19 min. which is the Latitude S.

Rule 3. If a Star comes to the Meridian in the North above the Pole, and have North Declination, ſubtracting the Declination from the Complement of the Altitude, the Remainder is the Latitude South. But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 12 of *June*, the *brighteſt in the Harp* comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 79 Degrees, from which ſubtracting the Declination, which is 38 deg. 33 min. North, there remains 40 Degrees 27 Minutes, which is the Latitude South.

Example 2. On the 11th of *September Andromeda's Head* comes to the Meridian in the N. at 8 minutes after Midnight, the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 35 min. gives 20 deg. 25 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and have South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 12th of *Decemb. Syrius* (*or the great Dog's Mouth*) comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 30 degrees, to which adding 16 deg. 20 min. the Declination South, gives 46 deg. 20 min. the Latitude South.

Rule 5. If a *Star* comes to the Meridian under the Pole, then add the Complement of the Declination to the Meridian Altitude, and the Sum is the Latitude either North or South, according to the Star's Declination.

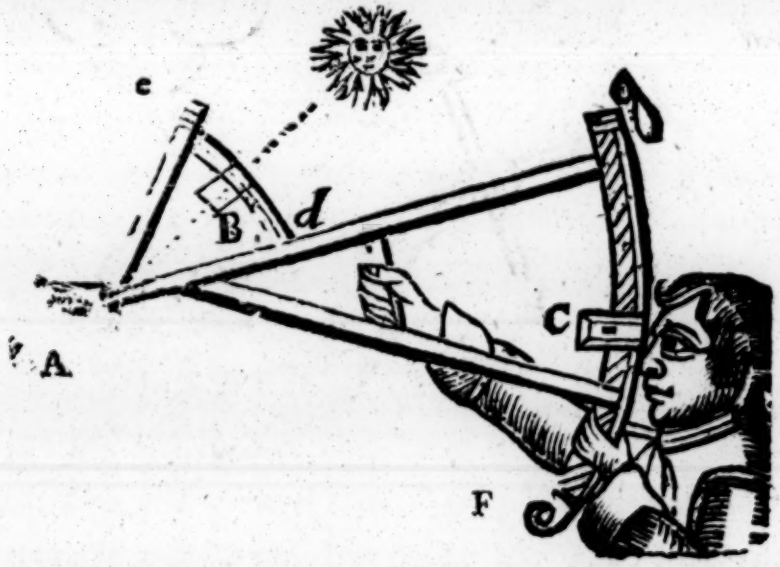
Example. On the 10th of *March*, the Pole Star comes to the Meridian under the Pole at 30 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 09 min. which added together gives 46 deg. 39 min. which is the Latitude North.

Rule 6. If the *Star* be in the Zenith, the Declination is the Latitude either North or South according to the Declination of the Star.

Rule 7. If the *Star* have no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South according as the *Star* is either to the Northward or Southward.

The Deſcription and Uſe of the Sea Quadrant.

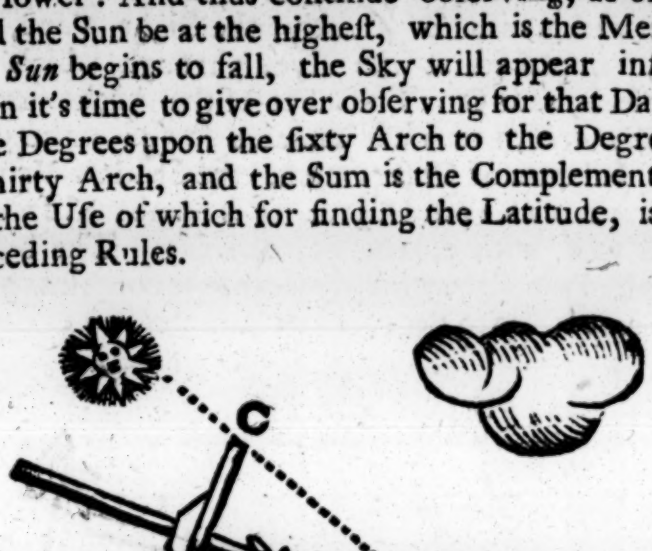
THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon as at A. The Shadow Vane, ſo called becauſe of its giving the Shadow upon the Horizon Vane in time of Obſervation as at B. Laſtly, the Sight Vane, which in time of Obſervation, is placed at the Eye, through which the Shadow and Horizon are ſeen, as at C. The leſſer of the Arches marked with *d e*, is called the *Sixty Arch*, becauſe it contains 60 (or more commonly of late) 5 degrees. In time of Obſervation, the Shadow Vane is placed upon this Arch always to an even Degree, it is numbered from the upper end at *e*, downward to *d*, with 5, 10, 15, 20, &c. The bigger Arch marked with *g F*, is called the *Thirty Arch*, becauſe it contains 30 (or rather 25) degrees, it is divided into degrees and minutes.



The Uſe of this Inſtruement is to take the *Sun's* Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the ſhadow Vane upon the ſixty (or leſſer Arch) to a Number of Degrees leſs than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, your back being turned towards the *Sun*, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the ſhadow of the upper edge of Shadow Vane to fall upon the upper part of the Slit in the Horizon Vane, where uſually (for Perſpicuity ſake) there is drawn a black Line; and if at the ſame time the Horizon appear thro' the ſaid ſlit in the Horizon Vane, that is the *Sun's* preſent Altitude: but if the *Sea* appear inſtead of the Horizon, then ſlide the Sight Vane lower towards F; if the Sky appear inſtead of the Horizon, then ſlide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian Alti-

Altitude, which is the greateſt Altitude the *Sun* will have that Day, and is the thing uſed to find the Latitude, continue obſerving, and as the *Sun* riſes the Sea will appear through the Horizon Vane; then muſt the ſight Vane be removed lower: And thus continue obſerving, as often as may be convenient, till the Sun be at the higheſt, which is the Meridian Altitude. When the *Sun* begins to fall, the Sky will appear inſtead of the Horizon, and then it's time to give over obſerving for that Day. Having thus done, add the Degrees upon the ſixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude; the Uſe of which for finding the Latitude, is ſufficiently ſhewed in the preceding Rules.



The Deſcription and Uſe of the Croſs-ſtaff, *or* Fore-ſtaff.

THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and it belongs to that Side of the Staff which is numbred from about 3 Degrees to 10 Degrees. Sometimes the Thirty Croſs, and the reſt of the Croſſes are ſo made, as that the Breadth thereof, ſerves inſtead of this Ten Croſs.

The ſecond Croſs is called the Thirty Croſs, and belongs to that ſide of the Staff which is numbred from about 10 deg. to 30.

The third Croſs is called the Sixty Croſs, and belongs to that ſide of the Staff which is numbred from about 20 to 60 Degrees.

The fourth and laſt Croſs is called the ninety Croſs, and belongs to that Side of the Staff which is numbred from about 30 to 90 deg.

This Staff is likewiſe numbred with the Complement to 9 Degrees, (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60, and ſo the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the *Sun* or *Stars*, which is done as followeth.

Firſt

Firſt Conſider how great the Sun's Meridian Altitude will be that Day; and accordingly uſe the Croſs moſt ſuitable, (*viz.*) if the Meridian Altitude be judged to be under 14 deg. uſe the tenth Croſs; if between 10 and 30, the Thirty Croſs: if between 30 and 60, the Sixty Croſs; if between 60 and 90, the Ninety Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat end of the Staff in A, to the outſide of the Eye, as near as may be, without hindring the Sight: Thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper end of the Croſs at C for the Sun and Star, and at the lower End at B for the Horizon, and if the Sea appears inſtead of the Horizon, remove the Croſs a little farther from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Croſs uſed in Obſervation, will be found the Deg. and Min. of Altitude of the Sun or Star. But the greateſt Altitnde being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the ſide of the Staff proper to the Croſs uſed, are found Deg. and Min. of the Sun's Meridian Altitude; which ſubtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions aforegoing.

The Deſcription and Uſe of the Nocturnal

IT conſiſts of three Parts, The firſt and unmoveable Part, on which is the Handle, by which to hold it in time of Obſervation; upon the foreſide of which, in the outermoſt Circle are the Days of the Month, and upon the innermoſt are ſet off the 24 Hours, and upon the Back ſide are the 32 Points of the Compaſs.

There are two Sorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Thoſe that are made for the *Great Bear* have *February* at the Top, but thoſe that are made for the *Little Bear* have *April*, but now they are commonly made for both *Bear*, having two Indexes.

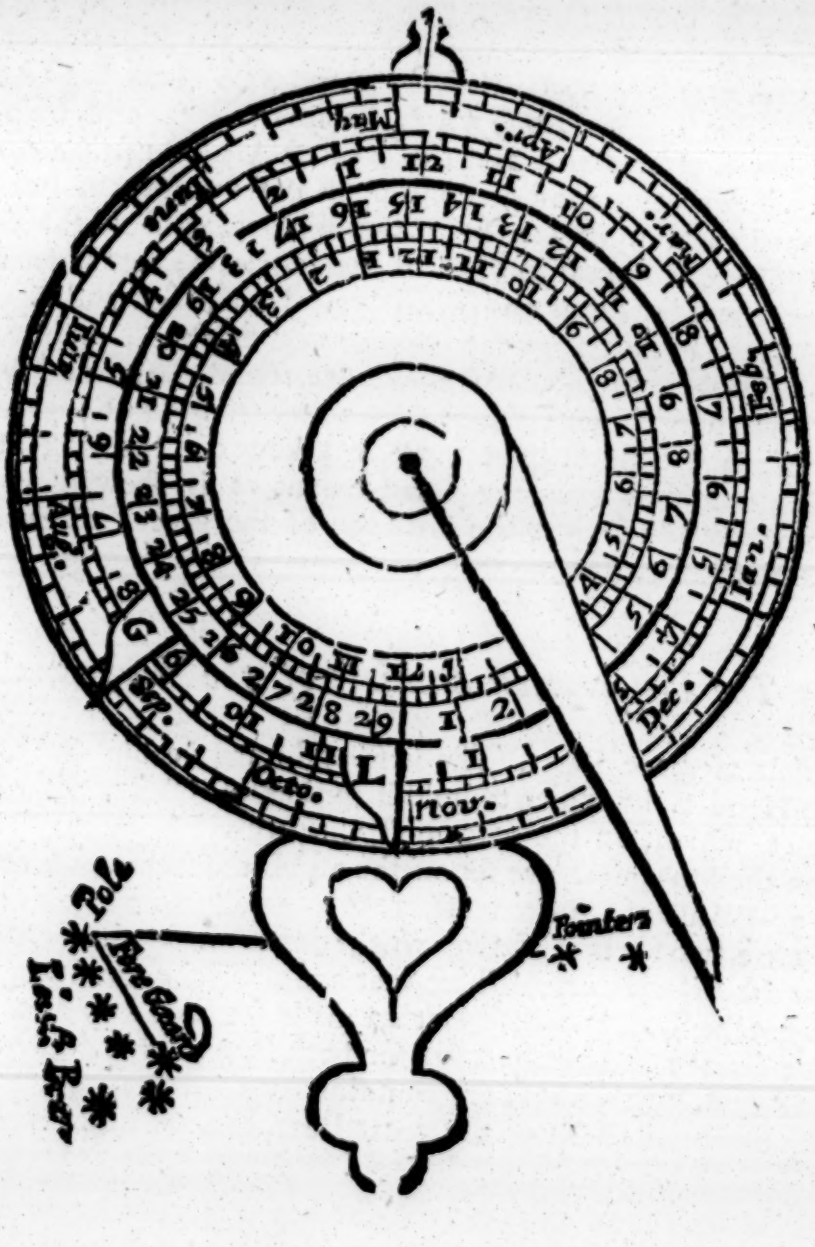
The ſecond, or middle Part contains two Circles, and the aforeſaid Indexes, one marked *G.* for the great Bear, and the other marked *L*, for

The little Bear. The outermost Circle is divided into 29 Days and a half, being the Moon's Age; the innermost into 24 Hours: The Index belonging to the Bear you intend to observe by, is to set to the Day of the Month at pleasure.

The third and uppermost Part is a long Index; the Edge of which (that respects the Center) must be turned to the Guards or Pointers, in time of Observation.

To find the Hour of the Night, and upon what Point of the Compass the Guards are.

The Figure of the Nocturnal.



To do this, First, set the Index of the middle Part to the Day of the Month, then hold the Instrument upright, which may be discerned by the Tip of the Top of the *Nocturnal*, then look through the Hole in the middle of the *Nocturnal* for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you observe by the Little or Great Bear, then shall the Edge of the Index (upon the innermost Circle of the little Part) give the Hour of the Night.

Also in *Nocturnals* made for both Bears, you have on the Backside two Circles marked at the Bottom, the outermost with L, and the innermost with G; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal*, as before directed, observe what Figures on the backside fall under the Edge of the long Index, in the Circle belonging to the Bear, by which you observe, and that is the Deg. and Min. that the Star is above or under the Pole, as is distinguished by the Words *Abo* & *Und.*

Example. I observe by the *Great Bear*, *Sept.* 6. I set the Index marked G to *Sept.* 6, and looking thro' the Hole to the Pole, I turn the long Index till it lie just over the two Pointers, as you see in the Figure of the *Nocturnal*, and find on the innermost Circle of the middle Part of the *Nocturnal*, that is 2 a Clock in the Morning; and on the Back side in the Circle marked G, I find the Pole Star is 2 deg. 26 min. above the Pole, *&c.* 'Tis found also by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, It is but looking upon the middle Piece of the *Nocturnal*, and in the outermost Circle find the Moon's Age; and opposite to it in the innermost Circle of the same Piece stands the Southing.

Ex. Suppose the *Moon* 25 days old and the time of her Southing requir'd. Look for 25 the *Moons* Age in the outermost Circle, oppofite to which in the innermost Circle stands 8, which is the Moon's Southing at 25 days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the *Moon's* Southing, add thereto the time of Flowing upon the Full and Change-Days at any place, and that gives the time of full Sea when required. But this hath been sufficiently shewed in another Place, therefore needs no Example.

The Use of the following Table of the Declination of the North Star.

THE Use of the Table is this: Having taken the Alt. of the Pole Star, then observe with the *Nocturnal* upon what Point of the Compass the Guards are; opposite to which in this Table stands the Declination (so called) which if the Star be below the Pole, is to be added to the Alt. but if the Star be above the Pole, to be subtracted therefrom to find the Latitude of the Place.

But the more exact way to find the Latitude, is by those other Directions for the Stars before given

A Table of the Declination of the North Star, *upon every Point of the Compass the Guards are upon, for both Sorts of* Nocturnals.

Points of the Compass.	For the Guards of the Little Bear.			For the Guards of the Great Bear, called the two Pointers.		
	D.	M.		D	M	
North	2	09	Above the Pole	2	20	Above the Pole
N by E	1	52		2	30	
N N E	1	29		2	35	
N E by N	1	02		2	33	
N E	0	53		2	26	
N E by E	0	06		2	13	
E N E	0	22	The North Star is under the Pole	1	55	The North Star under the Pole
E by N	0	52		1	33	
East	1	18		1	07	
E by S	1	41		0	38	
E S E	2	01		0	08	
S E by E	2	16		0	32	
South East	2	25		0	52	
S E by S	2	30		1	20	
S S E	2	29		1	44	
S by E	2	22		2	04	
South	2	11		2	20	
S by W	1	55		2	30	
S S W	1	34		2	29	
S W by S	1	10		2	27	
South West	0	43		2	23	
S W by W	0	14		2	13	
W S W	0	15	Above the Pole	1	55	
W by S	0	44		1	33	
West	1	11		1	07	
W by N	1	31		0	58	
W N W	1	58		0	08	
N W by W	2	14	Above the Pole	0	22	Ab. the Pole
North West	2	25		0	52	
N W by N	2	30		1	20	
N N W	2	29		1	44	
N by W	2	22		2	04	

If the former of the Guards be descending from the North or lower Part of the Merid. | If the former of the Guards be descending from the South, or upper Part of the Merid. | If the after Wheels, or two Pointers be ascending from the North or lowest part of the Merid. | If the two Pointers be descending from the South or upper Part of the Merid.

A Table of the Latitude and Longitude of the Principal Harbours, Headlands and Iſlands in the World; Corrected by the Lateſt and beſt Obſervations: accounting the Longitude from the Meridian of the LIZARD.

Note, *When the Latitude and Longitude of an Iſland is given, the middle of the Iſland is meant, except ſome particular Part of it be expreſſed.*

Places Names.	Latitude North		Longit. E or W	
The Coaſt of England.	D.	M.	D.	M.
BErwick	55	50	03	35 E
Newcaſtle	54	58	03	44 E
Stockton	54	33	03	49 E
Spurn	53	35	05	44 E
Yarmouth	52	45	06	54 E
LONDON	51	32	05	14 E
North Foreland	51	28	06	24 E
Beachy	50	48	05	39 E
Dunnoſe I. Wight	50	38	03	51 E
Portland	50	30	02	26 E
Start Point	50	09	02	29 E
LIZARD	49	55	00	00
Lands-End	50	06	00	09 W
St. Mary Scilly	49	57	01	07 W
Hartland Point	51	06	00	39 E
Lundy Iſland	51	20	00	34 E
Briſtol	51	32	02	39 E
St. David's Head	51	55	00	08 W
Barſey Iſle	52	46	00	16 E
Holy-head	53	23	00	34 E
Liverpool	53	20	02	16 E
White-haven	54	25	01	59 E
Carliſle	54	45	02	49 E
The Coaſt of Scotland.				
Glaſcow	55	53 N	01	09 E
N. Part of Sky Iſle	57	50 N	00	07 W

North Latitude

Places Names.	Latitude North		Long't. E or W.	
	D.	M.	D.	M.
North Part of Lewis Iſland	58	20	02	01 W
St. Kilday	58	02	04	51 W
Farra Head	58	23	00	09
Northern Iſles of Orkney	59	13	01	44
Shetland S. point	59	52	03	44
Buchaneſs	57	55	00	54
Aberdeen	57	24	03	37
Dundee	56	30	02	38
Edenburg	55	57	02	28

North Latitude — Eaſt Longitude

The Coaſt of Ireland

Dublin	53	20	01	52
Wexford	52	30	02	02
Waterford	52	07	02	38
Cork	51	49	04	16
Cape Clear	51	10	05	16
Limrick	52	22	04	34
Galway	53	10	04	29
Sline-head	53	20	06	01
Londonderry	54	55	02	46
Bellfaſt	54	36	01	36

North Latitude — Weſt Longitude

The Coaſt of Holland and Flanders.

Scaw	57	26 N	15	24 E
Helighland	54	28 N	13	49 E

Ham-

Places Names.	Latitude North.		Longit. West	
	D.	M.	D.	M.
Hambrough	53	41	15	38
Emden	53	05	13	14
The Fly	53	18	10	49
The Texel	53	10	10	13
Amſterdam	52	21	10	05
Rotterdam	51	55	09	35
The Brill	51	56	09	24
Sluyce	51	19	09	04
Calice	50	57	07	14
The Coaſt of France and Portugal.				
Diep	49	56	04	08
Cape de Hague	49	46	03	08
Caskets	49	50	02	42
Guernſey	49	36	02	34
Morlaix	48	37	01	24
Uſhant	48	30	00	09
Breſt	48	23	00	50
Penmark	47	48	00	59
Bell Iſle	47	20	02	04
Nantz	47	14	03	25
Iſland Diep	46	40	02	59
Iſland Ree	46	13	03	44
Rochel	46	10	04	00
Bourdeaux	44	50	04	50
Bilboa	43	30	02	14
Cape Ortegal	44	02	02	26W
Cape Finiſter	43	06	04	46W
Porta Port	41	18	04	06W
Burlings	39	39	05	01W
Rock of Lisbon	38	54	05	06W
Cape St, Vincent	37	00	04	18W
Cadiz	36	16	01	46W
Cape Trefalgar	36	10	01	16W
The Coaſt on the Main Continent within the Straits.				
Gibralter	36	11 N	00	29W
Cape de Gat	37	03 N	03	12 E

North Latitude. East Longitude.

Places Names.	Latitude North.		Longit. E. or W.	
	D.	M.	D.	M.
Cape Paul	37	58	24	52
Cape Martin	39	00	25	42
Barcelonr	41	30	27	35
Marſeilles	43	20	10	29
Toulon	43	06	10	54
Genoa	44	25	13	54
Leghorn	43	18	15	43
Rome	41	51	17	42
Naples	41	05	19	42
Cape Spartavento	38	00	25	12
Cape Collone	39	10	23	14
Gallipoli	40	08	23	53
Cape St. Mary	39	56	24	14
Ancona	43	31	19	54
Venice	45	18	18	24
Lepanto	38	20	27	09
Cape Matapan	36	35	27	34
Cape St. Angelo	36	41	28	34
Athens	38	00	29	43
Cape Martelo S. P. of Negropont	38	00	30	59
Cape Monte Sancto	40	05	31	19
Gallipoli	40	30	33	12
Conſtantinople	41	07	35	14
Smyrna	38	30	32	41
Epheſus	37	54	32	29
Antiocheta	36	40	36	51
Scandaroon	36	00	41	12
Tripoli	34	40	40	54
Alexandria	31	07	36	04
Cape Ruſato	33	15	27	09
Cape Miſerato	32	43	21	37
Tripoly	32	55	18	14
Cape Bona	37	05	15	14
Bona	37	00	12	14
Algier	36	40	08	19
Cape de tres forcas	35	34	03	49

North Latitude. East Longitude.

Tetuan

Places Names.	Latitude North		Longit E or W.	
	D.	M.	D.	M.
Tetuan	35	28 N	00	38 W
Seuta	35	55 N	00	33 W
Tangier	35	55 N	01	00 W
Islands within the Straits.				
Alboran	36	10	02	44
Formentaria	38	44	07	04
Yvica	39	05	08	04
Minorca City	39	48	07	54
Port Maon Minorca	39	42	09	36
Gallitta	37	40	13	48
Sardinia South End	39	12	13	48
Corsica North End	42	57	14	59
Gorgona	43	34	14	52
Captia	43	06	14	54
Lilboa	42	44	15	19
Messina	38	22	11	39
Maritimo	38	12	17	09
Cape Passero	36	48	21	18
Malta	36	15	19	49
Corfu	39	45	25	56
Chefalonia	38	15	27	03
Zant	37	47	26	24
Modon on Morea	36	52	26	46
Lemnos	39	50	30	41
Scio	38	20	29	09
C. St. John West End of Candy	35	20	28	41
C. Solomon East End of Candy	35	25	31	45
Rhodes City	36	40	33	14
West End of Cyprus	35	21	36	49
East End of Cyprus	35	35	39	39

North Latitude — East Longitude

The Coast of Barbary and Guinea.				
Cape Spartel	35	46	00	41
Sallee	33	43	01	16
Cape Canti n	32	16	04	06
Cape de Geer	30	04	04	56
Cape Bajador	26	12	09	16
Cape Olerado	23	41	10	36
Cape Blanco	20	35	11	41
Senegall	15	16	10	26

North Latitude — West Longitude

Places Names.	Latitude N or S.		Longit. E or W	
	D.	M	D.	M.
Cape de Verde	19	30	1	12 W
River Gambia	13	16	00	06 E
Serralion	08	36	07	01 W
Monserado	06	05	04	06 W
Cape Palmos	04	03	00	22 W
Jaque Jaque	04	16	02	44
Assene	04	15	04	14
Cape Three Points	04	13	05	59
River Volto	05	40	08	44
River Formosa	07	00	12	54
Cape Formosa	04	40	13	14
New Callabar	04	12	15	39
Old Callabar	03	18	16	46
River Camerones	04	02	18	24
River de Angra	00	49	18	29
Lopas	01	05	17	54
River Congo	05	45	20	39
Angola	08	51	21	10
Cape Negro	16	08	20	00
Cape St Thomas	23	10	19	37
Secos	28	56	20	46
Cape BonaEsperance	34	25	22	39

North Latitude — South Latitude — East Longitude

Western Islands				
Corvo	40	05	24	41
Flores	39	40	24	36
Fyal	38	53	22	02
Pico	38	32	21	17
St. George	38	56	20	56
Tercera	38	53	19	28
St. Michael	38	00	17	18
St. Maries	37	00	17	03

North Latitude — West Longitude

The Canary Islands.				
Ferro	28	00	12	58
Palma	28	50	12	46
Gomera	28	00	12	12
Teneriff	28	20	11	31
Madera West-end	32	17	12	08
Porto Sancto	32	50	10	36
Canaria	27	56	10	22
Fortaventura	27	54	08	10
Lancerota	28	32	07	40

North Latitude — West Longitude

Cape

Places Names.	Latitude N. or S.		Longit. E. or W.	
Cape de Verde Islands.	D.	M.	D.	M.
St. Antonio	17	10	30	34
St. Vincent	16	55	30	24
St. Lucia	16	45	30	16
St. Nicholas	16	40	29	36
Brava	14	35	29	52
Fuogo	14	42	29	14
Jago	15	20	28	24
Isle of May	15	16	27	26
Isle Sal	16	45	27	16
Bonavista	16	05	27	09
Southern Islands.				
St. Matthews	01	40 S	01	19 E
Ascension	08	10 S	07	21 W
St. Helena	16	06 S	00	26 W
Fernandepo	02	35 N	17	09 E
Princeps	01	25 N	16	14 E
St. Thomas	00	00	15	12 E
Annabona	01	42 S	14	02 E
The Coast of the Main Continent in the East-Indies.				
Cape Lagulias	35	35 S	23	54
Cape Corientes	23	52 S	40	49
Mosaimbique	15	05 S	45	44
River de Fuegos	00	00	46	29
Cape Bassos	04	00	55	04
Cape Guardafoy	11	50	57	44
Cape Rosulgat	22	27	65	59
Cape Muca	26	56	62	24
Bussera	30	00	54	19
Surrat	21	08	78	39
Goa	15	22	79	51
Calecute	11	17	80	08
Cochin	09	58	81	59
Cape Comerine	07	50	83	39
Fort St. George	13	08	86	56

North Latitude. East Longitude.

Places Names.	Latitude N or S.		Longit. E. or W.	
	D.	M.	D.	M.
Dew Point	15	50	87	19
Visegapatam	17	40	90	21
C. Palmaris	20	45	93	24
Bengal	22	27	97	05
C. Negrais	26	23	98	19
C. Malacca	20	25	108	34
Siam Entrance	13	10	116	15
Cambodia Entrance	10	30	100	34
Cochin	18	25	109	12
Cantam	23	30	118	34
Amoy or Quemoy	24	35	122	09
Lampo	30	10	125	39
Nanquin	32	52	125	19
Islands in the East-Indies.				
Madagascar S. end	26	06	51	34
St Laurence N. end	12	10	55	24
Mayetta	13	10	50	59
Mohilla	12	15	48	55
Comero	11	50	48	59
St. Juan de Novo	17	30	47	49
Mauritius	20	05	60	19
Digo Royes	19	45	66	49
Romeras de Castelamos	29	05	72	40
Amsterdam	39	50	79	38
St. Brandon	16	38	69	44
Digo Gratiosa	08	42	74	19
Quabella	03	49	57	53
Bassos de Chagos	05	05	75	39
Yas de Digo Rays	00	00	77	19
Maldavia N. end	07	05	78	19
Maldavia S. end	01	00	81	29
Malique	09	00	78	29
Sacatra	12	28	60	51
Abdeleur	12	10	59	37
C. Gallo de Zelone	06	07	85	59

South Latitude. East Longitude.

Yas

Places Names.	Latitude N. or S.		Longit E. or W.	
	D.	M.	D.	M.
Yas de Amber	00	00 N.	57	44
Andaman	13	00	96	39
Nicobor	07	05	98	09
Sumatra NW End	05	28	95	59
Verkins Iſland	02	22	96	21
Naſſau Iſland	02	44	103	46
Bencola	03	50	106	27
Sumatra S E End	05	42	109	18
Engano	05	40	106	07
Selam	08	20	107	27
Princes Iſland	06	30	109	16
Bantam in Java	05	47	110	25
Batavia	05	37	117	41
Java Eaſt End	08	35	109	32
Straits of Sundy	05	52	111	51
Banca South End	03	25	118	06
Borneo South Point	04	14	131	51
Bandy Iſles	05	05	131	51
Celebes South end	06	00	122	41
Celebes North end	01	40	126	44
Mindano Weſt point	06	30	123	49
Borneo North point	07	10	117	59
Luconio S. point	12	30	126	04
Luconio NE. poi.	18	35	124	19
Anain W. point	19	30	113	20
Anain E. point	19	55	116	30
Formoſa S. point	22	00	124	44
Formoſa N. point	25	32	125	39
Piſcadore Iſles	23	30	122	49
Iſlands Chuſan	30	38	125	49
Japan S.E. point	39	50	140	29
Japan SW. point	39	10	132	00

North Latitude — South Latitude — East Longitude

The Coaſt of America in the South Sea from Callifornia to Cape Horn.

Cape St. Sebaſtian	42	30	124	41
Cape St. Lucio	23	25	106	42
Cape Corientes	19	40	105	16
Aquapulco	17	00	101	14
Aquatulco	15	27	95	49
Guatimala	14	25	99	46
Panama	08	56	77	04

North Latitude — West Longitude

Places Names.	Latitude N or S.		Longit. E. or W.	
	D.	M	D.	M.
Bay Bonaventuro	03	28 N	74	52
Iſland of Gallopega	00	00	84	56
Cape del Ajuga	16	38	73	36
Cima	12	30	68	16
Arica	18	12	68	56
La Serena	24	40	71	18
I. Juan Fenando	33	20	81	34
Baldivia	39	35	76	06
Port Steven	46	50	77	22
Cape Victory	52	15	78	06
Cape Horn	57	58	74	41

South Latitude — West Longitude

The Coaſt of Brazile in South America from Cape Horn to Cape Roque.

Magellan Entrance	51	58	70	16
River Julian	48	40	69	18
Cape Blanco near R Comarones	46	50	66	51
Buenos Aries R Plata	36	10	52	16
River Grand	31	55	46	26
St Katherines	28	00	42	36
Cape Frio	23	10	37	42
Spirito Sancto	19	58	36	46
P. Segura	16	22	35	44
Bay Todus Sanctus	13	00	35	21
R. St. Franciſco	10	55	32	32
Cape St. Auguſtine	08	05	30	24
Cape Roque	05	00	30	38
Triſtian de Cunha	37	05	10	24
Trinidada	00	30	24	46

South Latitude — West Longitude

The Coaſt of the Main Continent in the Weſt-Indies.

R. Amazones Entr.	00	00	43	46
North Cape	02	05	44	41
Suranam	06	00	51	41
Oronoque	08	15	53	51
C. Coquibaca	12	50	65	26
Carthagena	10	50	70	36
Scots Settlement	08	30	73	31
Nicaragua Entrance	11	15	29	51
Cape Cataco	21	12	33	41

North Latitude — West Longit.

Places Names.	Latitude North. D.	M.	Longit. West D.	M.
Campecne	19	20 N	87	51 W
La Vera Cruz	19	15 N	95	11 W
Eſcondide	18	20 N	93	46 W
Cape Florida	24	48 N	76	41 W
The Caribbee Iſlands.				
Trinidada	10	05	54	51
Tobago	11	10	54	06
Granado	12	07	55	16
Barbadoes	13	10	52	49
St. Vincent	13	12	54	08
St. Lucia	13	52	54	03
Martinico	14	48	53	11
Dominico	15	35	53	13
Marigallante	15	53	53	06
Guardalupa	16	15	54	09
Monſerat	16	40	54	21
Antegoa	17	00	54	07
Nevis	17	06	55	04
St. Chriſtophers	17	22	55	21
Barbuda	17	43	54	11
St. Bartholomew	17	54	55	31
St. Martins	18	05	55	25
Anguilla	18	13	55	41
Virgins	18	23	57	08
St. Cruz	17	38	57	21
Bieque	18	00	58	01
Porto Rico St. Johns	18	33	59	06
St. Domingo Hiſpan.	18	15	63	36
P. Royal Jamaica	18	00	71	49
Eaſt End of Cuba	20	20	68	51
Havana	22	50	78	16
Bay Hondy	22	35	79	26
Cape St. Antonia	21	50	81	18
Bahama Iſlands.				
Bermudas	32	30 N	56	16 W
N. Point of Bahama Bank	28	22 N	73	01 W

North Latitude. West Longitude.

Places Names.	Latitude North. D.	M.	Longit. Weſt. D.	M.
Bahama Iſland	27	05	73	44
Abacco S. point	25	50	72	06
Harbour Iſland	25	40	71	21
Androſs N. Point	25	15	73	46
Providence	25	00	72	31
Illathera S. point	24	30	70	48
Cat Iſland	24	25	70	06
Watling Iſland	24	07	69	36
Rum Key	23	45	69	51
Exuma	23	25	70	43
Crooked Iſle N. Point	23	03	68	46
Atkins Key	22	30	69	01
Meraparvouz	21	57	69	26
Atwood Keys	23	09	68	16
French Keys	22	40	68	21
Mayaguana	22	35	67	46
Hogſties	21	15	68	36
Hyneago	20	57	68	06
Cankcoſs Bank N. Point	20	50	66	01
Turks Iſland	21	35	64	54
Abrollo N. point	21	40	63	26
Plate wrack	20	03	62	56
The Coaſt of Carolina, Virginia, Maryland, Penſylvania, New-England, and New-found-land.				
Charles Town upon Aſhly River	32	40	73	36
Cape Hatteras	35	10	69	11
Cape Henry	37	00	69	16
Cape Charles	37	14	69	01
Cape Hinlopen	39	04	68	11
Long Iſland	40	50	65	26
New York	41	00	66	51

North Latitude. West Longitude.

Cape

Places Names.	Latitude North		Longit. West	
	D.	M.	D.	M.
Cape Cod	42	10	62	31
Boſton	42	35	63	36
Cape Sable	43	45	58	11
Iſland Sable	44	30	53	51
Cape Britain	46	20	53	06
Quebeck	47	05	64	36
Bay of Breſt	52	10	49	46
Bell Iſland	52	05	48	56
Cape St. John	50	09	47	21
Cape Bonaviſta	49	11	46	49
Trinity Bay	48	27	49	47
Conception Bay	47	53	48	56
St. John's Harbour	47	28	48	41
Bay of Bulls	47	40	49	32
Cape Race	46	30	48	11
Cape St. Mary	47	10	48	06
Placentia	47	57	49	46
Cape Roy	48	21	52	01

North Latitude — West Longitude

The Coaſt of Hudſon's-Bay, and the Straits.

Buttons Iſles	60	05	64	56
Cape Charles	62	35	70	06
Cape Walſingham	63	05	72	26
Mansfield Iſle	62	20	70	16
Cape Jones	55	03	73	01
Ruperts River	51	16	73	41
Albany River	52	32	77	51
The Cubbs	54	18	77	36
C Henrietta Maria	55	06	77	48
Port Nelſon	57	05	87	36
Cape Churchil	59	00	87	43
C. Southampton	61	57	83	16
Shark Point	64	27	78	06
Nottingham Iſle	63	38	74	32
Q Ann's Foreland	63	32	69	37
Reſolution Iſle	61	55	59	36
Cape Farewell	59	10	41	31

North Latitude — West Longitude

Places Names.	Latitude North		Longit. West	
	D.	M	D.	M.

The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.

Sound Royal	66	22	19	29
Bargazar Point	66	30	16	26
Whales Back	65	27	15	19
Merchant Foreland	63	20	19	19
Halliford	64	30	29	29
Fair Foreland	65	10	31	59
Grims Iſland	66	51	22	59
Weſtmania Iſles	63	51	23	24
Iſles of Fero	62	06	00	14
Beerenberg, or John Mains Iſle	71	45	09	44
Point Lookout	76	40	21	39
Horn Sound	77	23	19	34
Fair Foreland	79	18	16	04
Hacluits Headland	79	55	17	14
Helies Sound	79	15	17	19
Lees Foreland	78	05	28	39
Whales Head	77	18	26	44
Hope Iſland	76	22	27	14
Cherry or Bear Iſle	74	35	23	19
Admiralty Iſland	75	05	55	04
Fretum Borough	69	55	67	19
Cape Candenoſe	69	27	47	44
Catnoſe	65	43	40	28
Archangel Bar	65	05	40	44
Croſs Iſland	66	31	41	47
Sweetnoſe	68	08	39	56
Kilduyn	69	32	35	29
North Cape	71	25	27	14
Surroy	71	05	21	54
Tromſound	70	18	21	14
Loefort SW. Point	67	47	14	49
Dronton	64	00	15	54
Stadland	62	10	09	52
North bergen	60	16	10	54
Naze of Norway	57	50	12	36

North Latitude — East Longitude

Places Names.	Latitude North		Longit. West		Places Names.	Latitude North		Longit. East.	
Sea Coast in the Sound, and Baltick Sea.	D.	M	D.	M.		D.	M.	D.	M.
Mardau	58	25	14	19	Revel	59	00	29	59
Larwick	58	54	14	34	Riga	56	50	30	04
Chriſtiana	59	10	14	59	Derwinda	57	20	27	14
Maeſterland	57	58	16	59	Coningsberg	55	00	25	44
Gottenberg	57	33	17	39	Dantzick	54	22	24	14
Elſinor	56	00	17	46	Wisby in Gotland	57	37	24	04
Copenhagen	55	44	17	49	Bornholm	55	27	20	07
Valſterborn	5	20	18	09	Straelſound	54	45	18	34
Kalmer	56	40	1	54	Lubeck	54	25	16	19
Stockholm	59	20	23	39	Anout	56	42	16	12
Wyborg	60	20	34	40	Leſou	57	05	15	54
Petersburg	59	25	35	04	Scaw	57	26	15	24
Narve	58	39	33	28					

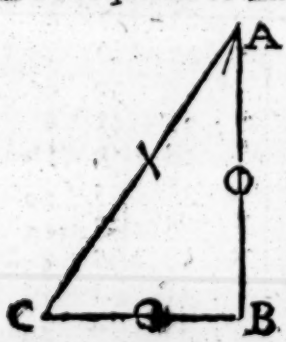
North Longitude — East Longitude — North Latitude — East Longitude

Problems of Plain Sailing, wrought by the Logarithms, *and by* Gunter's Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſails South Weſt by South, 382 Minutes, and it be required to find the Difference of Latitude and Departure.



In the Triangle A B C.

AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe.
ACB (or the Angle at C) the Complement of the Courſe to 90°.

Charac-

Characters used in Navigation *and* Astronomy.

S. stands for Sine.
T. for Tangent.
Sc. Sine Complement. Tc. Tangent Complement.
The given Sides and Angles of a Triangle are marked with a Dash thus (')
The required Sides and Angles with a Cypher thus (°).

The Operation by the Logarithms. *For the Difference of Latitude.*

As Radius	10.000000
To the Distance sailed 382 Minutes	2.582063
So is Sc. of the Course 56° 15′	9.919846
To the Difference of Latitude 317 Minutes $\frac{2}{10}$	12.501909

For the Departure.

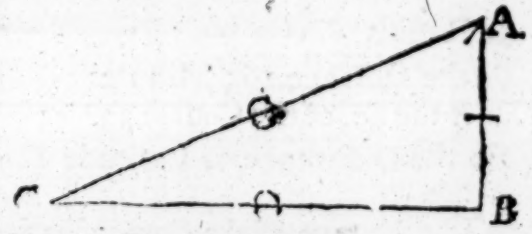
As Radius	10.000000
To the Distance sailed 382 Minutes	2.582063
So is the S. of the Course 33° 45′	9.744730
To the Departure, 212 Minutes $\frac{2}{01}$	12.326802

The Operation by Gunter's Scale.

One Foot of the Compasses being in the Radius, or S. of 8 Points, extend the other to the Distance 382 Minutes, the said Extent laid from S. Course 3 Points will reach to 212 Minutes the Departure from the Meridian, and the Compasses kept at the same Distance will reach from the Sc. Course 5 Points to 317 Minutes, the Difference of Latitude as above.

PROB. II. The Course and Difference of Latitude given, to find the Distance and Departure.

Suppose a Ship sail W. S. W. untill the Difference of Latitude be 219 Leagues, and the Distance and Departure required.



The Operation by the Logarithms. *For the Distance.*

As Sc. of the Course 22° 30′	9.582840
To the Difference of Latitude 219 Leagues	2.340444
So is Radius	10.000000
To the Distance, which is 572 $\frac{3}{28}$ Leagues	2.757604

For

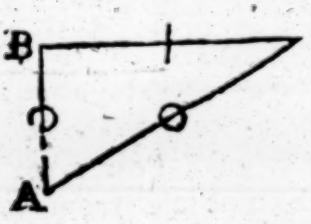
For the Departure.

As the Radius	10.000000
To the Distance 527 $\frac{3}{10}$ Leagues found before	2.757604
So is the Sine of the Course 67° 30′	9.965615
To the Departure 528 $\frac{7}{10}$ Leagues	12.723219

By the Gunter.

The Compasses being extended from the S. of 2 Points, the Complement of the Course to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572 Leagues the Distance, and the same Extent of the Compasses from the S. of the Course 6 Points, shall reach to 529 Leagues, the Departure.

PROB. III. The Course and Departure given, to find the Distance and Difference of Latitude.



Suppose a Ship sails North East by East, until her Departure be 220 Minutes, the Distance and Difference of Latitude required.

By the Lagorithms. For the Distance

As the S. of the Course 56° 15′	9.010816
To the Departure 220 Minutes	2.342423
So is the Radius	10.000000
To the Distance 265 Minutes	2.422577

For the Difference of Latitude.

As Radius	10.000000
To the Distance 265 Minutes	2.423240
So is the Sc. of the Course 33° 45′	9.744739
To the Difference of Latitude 147 Minutes	12.167985

By the Gunter.

The Extent of the Compasses from the S. of the Course 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to the Distance, and the same Extent of the Compasses from S. 3 Points the Complement of the Course, shall reach to the Difference of Latitude 147 Minutes as above.

PROB. IV. The Distance and Difference of Latitude given, to find the Course and Departture.

Sup-

Suppoſe a Ship ſails between the North and the Weſt 206 Miles until the Difference of Latitude be 197 Miles, the Courſe and Departure required.

By the Logarithms. *For the Courſe.*

As the Diſtance 206 Miles	2.313867
To the Radius	10.000000
So is the Difference of Latitude 197 Miles	2.294466
To the Sc. of the Courſe; which is N. 17° 00′ W.	9.980599

For the Departure.

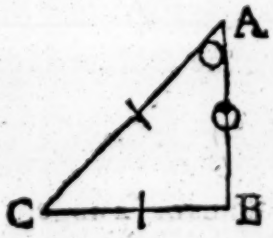
As Radius	10.000000
To the Diſtance 206 Miles	2.313867
So is the S. of the Courſe 17° 00′	9.465935
To the Departure 60 Miles	11.779802

By the Gunter.

For the Courſe. The Extent from the Diſtance 206 Miles, to the Difference of Latitude 197 Miles, ſhall reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courſe, which ſubtracted from 90d. is 17 deg. 00 min. the Courſe N. Weſterly or N. by W. half W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Courſe 17 deg. 00 min. ſhall reach from the Diſtance 206 Minutes to the Departure 60 Minutes as above.

PROB. V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.



Suppoſe a Ship ſails between the South and the Weſt 247 Minutes, until the Departure be 197 Minutes, and it be required to find the Courſe and Difference of Latitude.

The Operation by the Logarithms. *For the Courſe.*

As the Diſtance 247 Minutes	2.392697
To Radius	10.000000
So is the Departure 197 Minutes	2.294466
To the Sine of the Courſe 52 deg. 54 min. Weſterly	9.901769

For

For the Difference of Latitude.

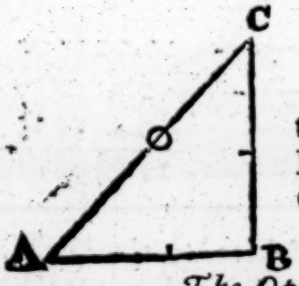
As Radius ——— 10.000000
To the Distance 247 Minutes ——— 2.392697
So is the Sc. of the Course 52 deg. 54 min. ——— 9.780467
To the Difference of Latitude 149 Minutes. ——— 12.173164

By the Gunter.

For the Course. The Extent of the Compasses from the Distance 247 Minutes, to the Departure 197 Minutes, shall reach the same way from Radius S. 90 deg. to the S. of the Course, 52 deg. 54 min. South Westerly, or South West $\frac{3}{4}$ W.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to the S. 37 deg. 06 min. the Complement of the Course, will reach the same way from the Distance 247 min. to the Difference of Latitude, 149 min.

PROB. VI. The Difference of Latitude and Departure given, to find the Course and Distance.



Suppose a Ship sails between the South and West until the Difference of Latitude be 154 Leagues, her Departure 200 Leagues, and it be required to find the Course and Distance.

The Operation by the Logarithms. *For the Course.*

As the Difference of Latitude 154 Leagues ——— 2.187521
To Radius ——— 10.000000
So is the Departure 200 Leagues ——— 2.301030
To the Tang. of the Course 52 deg. 24 min. South Westerly 10.113509

For the Distance.

As the Sc. of the Course 52 deg. 24 min. ——— 9. 785433
To the Difference of Latitude 154 Leagues ——— 2.187521
So is the Radius ——— 10.000000
To the Distance 252 Leagues ——— 2.402088

By the Gunter.

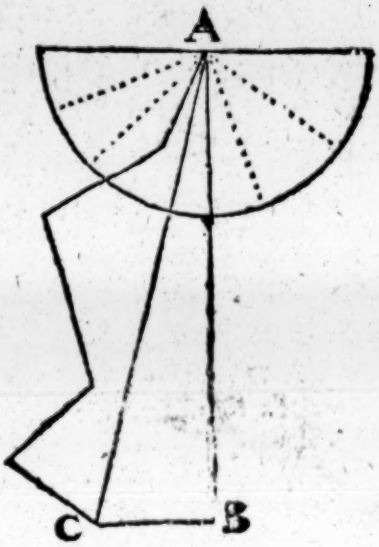
For the Course. The Extent of the Compasses from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, shall reach from Radius or Tangent of 45 deg. to the Tang. of the Course, 52 deg. 24 min. South Westerly, or South West $\frac{3}{4}$ West.

For the Distance. The Extent from the S. of 37 deg. 36 min. the Complement of the Course, To Radius, or the S. of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Distance 252 Leagues.

PROB.

PROB. VII.

This Problem ſhews the manner of orking a Traverſe, and is very uſeful keeping a Reckoning by Plain Sailing.



Example.

Suppoſe a Ship bound to a certain Port, nd ſhe ſails firſt S.S.W. 40 min. then W. 60 min. then S. by E. 63 min. VSW. 49 min. then S.E. by S. 56 min. e Difference of Latitude and Departure e Ship hath made, with the direct Courſe nd Diſtance is required.

The Operation by the Logarithms.

For the Difference of Latitude for the firſt Courſe.

s Radius	10.000000
o the Diſtance 40 min.	1.602060
o is the Sc. of the Courſe 22° 30′	9.965615
o the Difference of Latitude 36 min. $\frac{8}{10}$	11.567675

For the Departure of the firſt Courſe.

s Radius	10.000000
o the Diſtance 40 min.	1.602060
o is S. of the Courſe 22° 30′	9.582840
o the Departure 15 min. $\frac{3}{10}$	11.184900

By the Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Di- nce 40 min. that Extent in the Compaſſes laid from the Sine of the urſe 2 Points will reach to 15 min. $\frac{3}{10}$ the Departure, and the Compaſſes ing kept to the ſame Extent, and laid from Sine 6 Points the Comple- ent of the Courſe will reach to 36 min. $\frac{8}{10}$ the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and De- rture for each Courſe and Diſtance; which being found, place in a able as follows.

A Traverse Table.

Course.	*Distances.*	*North.*	*South.*	*East.*	*West.*
S. S. W.	40		37.0		15.3
S. W.	60		42.4		42.4
S. by E.	63		61.8	12.3	
W. S. W.	49		18.8		45.3
S. E. by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0
					43.4
				Dep.	59.6

The Explanation of the Table.

For the placing the Difference of Latitude and Departure in their proper Columns, observe, that if the Course be Northerly the Difference of Latitude is put in the North Column; if it be Southerly in the South Column; and if the Course be Easterly, the Departure is put in the East Column; if Westerly in the West Column.

Thus having framed the Table, add up the North, South, East, and West Columns severally, whereby the Difference of Latitude appears to be 206 $\frac{6}{10}$ Minutes South, because there is nothing in the North Column. The Departure 59 $\frac{6}{10}$ Minutes West, because so much the West Column exceeds the East: By which Difference of Latitude and Departure, find the direct Course and Distance as follows.

The Operation by the Logarithms. *For the direct Course.*

As the Difference of Latitude 206 min. $\frac{6}{10}$	2.315130
To the Radius	10.000000
So the Departure 59 min. $\frac{6}{10}$	1.775246
To the T. of the Course 16° 5′ South Westerly because the South and West Columns exceed the North and East	9.460116

For the Distance.

As the Sc. of the Course 16° 5′	9.982660
To the Difference of Latitude 206 min. $\frac{6}{10}$	2.315130
So is Radius	10.000000
To the Distance required 215 Minutes	2.332470

By

By the Gunter. *For the direct Course.*

The Extent of the Compasses from the Difference of Latitude 206 min. to the Departure 59 min. shall reach from the Tangent of 45° (or Radius) to the Tangent of 16° 5′ the Course required.

For the Distance.

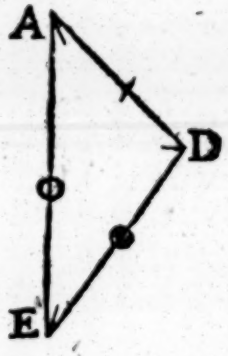
The Extent from S. 73 deg. 55 min. the Complement of the Course, to S. 90 deg. *viz.* Radius, shall reach from the Difference of Latitude 206 min. to the Distance 215 Minutes.

Oblique-angled Plain Triangles, applied in PROBLEMS *of* Plain-Sailing, *and wrought by the* Logarithms, *and* Gunter's Scale.

PROB. I. THE Angles and one of the sides given, to find either of the other sides.

Example.

Suppose there are two parts both under one Meridian, a Ship sails from the Northermost S.E. 206 Miles, another Ship sails from the southermost North East by North, a certain number of Miles, and meets with the first Ship: the Distance between these two Ports, and the Distance sailed by the second Ship is required.



In the Triangle A D E.

A and E represents the two Ports, AD the first Ships distance. ED the second Ships distance. AE the distance between the two Ports.

The Operation by the Logarithms. *For the Distance between the two Ports.*

As S. AED 33° 45′ —— —— —— —— ——	Co. Ar. 0.255261
To AD the first Ship's Distance 206 min. —— —— ——	2.313867
So is S. ADE 105° 15′ which subtract from 180 deg. ——	9.991573
To AE the distance between the two Ports 364 min. —— ——	12.560701

In all Operations where Radius is not one of the three given Terms, to save the Labour for subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm

garithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarithm Sine found in the Table is 9.744739 wherefore beginning at the Left-hand ſay, 9 from 9 there remains 0; 7 from 9 remains 2; 4 from 9 there remains 5; 4 ſtom 9 there remains 5; 7 from 9 remains 2; 3 from 9, there remains 6; 9 from 10, there remains 1. So the Complement Arithmetical of the firſt Logarathm, is 0.255261, which added to the other two Logarithms and from the Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90°, ſubtract the Degree and Minute from 180° the Sine of the Remainder is the Sine required.

For the ſecond Ship's Diſtance.

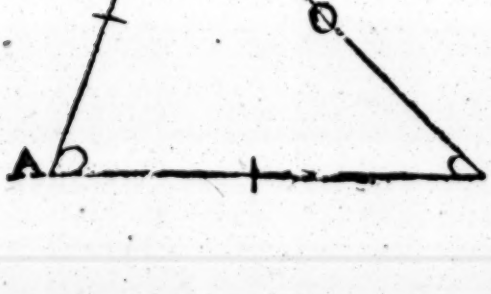
As S. AED 33° 45′ ——	Co. Ar. 0.255261
To AD the firſt Ship's Diſtance 206 min. ——	2.313867
So is S. DAE 45° 00′ ——	9.849485
To DE the ſecond Ships Diſtance, 262 min. ——	12.418613

By the Gunter. *For the Diſtance between the two Ports.*

The Extent of the Compaſſes from S. of 33° 45′ to the S- ADE 78° 45′ (*viz.* the Complement of 101° 15′ to 180°) ſhall reach from 206 min. the firſt Ships Diſtance, to 364 min. the Diſtance between the two Ports as above.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33° 45′, to the S. of 45° 00′ ſhall reach from 206 min. the firſt Ships Diſtance, to 262 min. the ſecond Ships Diſtance required.



PROB. II.

Two ſides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third ſide.

Example.

Suppoſe two Parts, whoſe Bearing is North Eaſt and South Weſt diſtant 396 Miles, a Ship at the Northermoſt ſails South South Eaſt, and another Ship at the ſouthermoſt ſails thence 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ships diſtance are required.

In

In the Triangle ADE.

A repreſents the Southermoſt Port, D the Northermoſt.
AD the Diſtance between the two Ports.
DE the Courſe and Diſtance ſailed by the firſt Ship.
AE the Courſe and Diſtance ſailed by the ſecond Ship.

The Operation by the Logarithms. *For the ſecond Ship's Courſe.*

As AE the ſecond Ship's diſtance 518 min. —— Co. Ar. 7.285671
To S. ADE 67° 30° —— 9.965615
So is AD the Diſtance between the two Ports 396 min. —— 2.597695
To S. AED 44° 56′ —— 19.848981

The Angle at D 67° 30° and the Angle at E. 44° 56′ being added together and ſubtracted from 180° gives 67° 34′, the Angle at A, which makes neareſt 6 Points, and 6 Points reckoned from the North Eaſt to the Southwards gives ESE. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. ADE 67° 30° —— Co. Ar. 0.034384
To AE the ſecond Ship's Diſtance 518 min. —— 2.714329
So is S. DAE 67° 34′ —— 9.965824
To DE the firſt Ship's Diſtance 518 min. —— 12.714537

By the Gunter.

The Extent of the Compaſſes from 518 min. to S. 67° 30′ ſhall reach from 396 to S. 44d. 56 min. which added to the Angle at D, and the ſum ſubtracted from 180d. gives 67°. 30′ the Angle at A as above.

For the firſt Ship's Diſtance. The Extent from S. 67d. 30m. to 518 min. will reach from S. 67d. 34m. to 518 min. the Ship's Diſtance as above.

PROB. III.

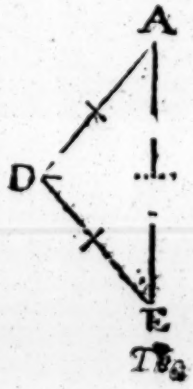
Two ſides and the contained Angle given to find the other Angle.

Example.

Suppoſe two Ships ſail from one Port; one ſails N. Eaſt 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships required.

Let D repreſent the Port, DA the firſt Ships Diſtance, and DE the ſecond.

	Miles
	140
	115
	255
Diff.	25



The Operation by the Logarithms. *For the bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 min. —— Co. Ar. 7.593459
To the Difference of the said Sides 25 min. —— 1.397940
So is the T. of half the Sum of their opposite Angles 50° 37′ —— 10.085698
To the T. of half their Difference, which is 6d. 48m. —— 19.077097

The half Difference added to the half Sum, gives 57° 25′, the greater Angle AED. The half Difference subtracted from it, gives 43° 49′, the lesser Angle DAE. Wherefore the Bearing of the two Ships is N. E.erly or South Westerly 1° 11′. *For the distance of the two Ships.*

As S. AED 57 deg. 25 min. —— Co. Ar. 0.074373
To AD the first Ships Distance 140 min. —— 2.146128
So is S. ADE 78 deg. 45 min. —— 9.991573
To AE the distance of the Ships, 163 min. —— 12.212074

By the Gunter. *For the Bearing of the Ships.*

The Extent of the Compasses from the Sum of the Sides, 255m. to their Difference 25 min. shall reach from the T. of the half Sum of the required Angles 50° 37′ to the T. of half the Difference of the said Angles 6° 48′.

In the foregoing Operation by the *Gunter*, the Practitioner may be at a Loss, because in extending the Compasses from the T. 50′ 37′ decreasing, it will fall beyond the T. of 45 deg. at the End of the Line. To remedy this Place the Extent from 255 to 25, from the T. 45d. and it will reach to T. of 5° 37′; then letting one Point stand at 5° 37′, extend the other to the T. 50° 37′ this extent place from the T. of 45°. shall fall on the T. 6° 48′ required. *For the Distance of the Ships.*

The Extent from the Sine of 57d. 25m. to the Sine 78d 45m. shall reach from 140 min. to 163 min.

PROB. IV. Three Sides being given to find an Angle.

Example. Suppose there are two Ports both in one Latitude, distant 536 Miles, a Ship sails from the Eastermost 306 Miles between the South and the West: Another Ship sails from the Westermost 290 Miles, and meets with the first Ship. The Course that each Ship steer'd is required.

Let A and E represent the two Ports, D the Place where the Ships meet.

This Question is resolved by letting fall a Perpendicular D B; reducing the Oblique Triangle ADE into the two Right-angled Triangles ABD and BDE, then the Operation is as follows.

First, find the Segment of the Base BE, thus.

As the Base AE 536 Miles —— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596 Miles —— 2.775524
So is the Difference of the said Sides 16 Miles —— 1.204120
To a Segment of the Base which is 18 Miles —— 11.250209

The

The whole Base is ——— 536 min.
The Difference of the Segment is ——— 18
Sum is ——— 554
Half Sum ——— 277 the greater Segment BE

Then say, *For the Ship's Course.*

As DE the first Ships Distance 306 min. ——— 2.485721
To Radius ——— 10.000000
So is the greater Segment BE 277 m. ——— 2.442479
To Sc. BED 25° 9′ ——— 9.956758

The Angle at E is the Course from the West southerly, so the first Ship steers South 64° 51′ West, or S. W by W. three quarters W. almost.

For the second Ship's Course.

As AD the second Ships Distance 290 min. ——— Co. Ar. 7.537602
To Sine AED 25° 9′ ——— 9.628378
So is DE the first Ships Distance 306 ——— 2.485721
To Sine DAE 26° 39′. ——— 19.651701

The Angle at A is the Course from the East southerly, so the second Ship steers South 63 deg. 21 min. East, or E. by S. half S.

By the Gunter. *For the Difference of Segments of the Base.*

The Extent of the Compasses from the Base AE 536 min. to the Sum of the sides 596 min. shall reach from the Difference of the Sides 16, to the Difference of Segments of the Base 18 min. with which proceed as before.

For the first Ship's Course.

The Extent from the Distance 306 min. to the greater Segment 277 m. shall reach from Radius or Sine 90 deg. to Sine 64 deg. 51 min. the Complement of BED 25 deg. 9 min. required.

For the second Ship's Course.

The Extent from 290 min. the second Ship's Distance, to 306 min. the first Ship's Distance, shall reach from the Sine 25 deg. 9 min. to the Sine 26 deg. 39 min. the Angle at A required.

PROB. V.

Two sides and their contained Angle given, to find the third side.

Example.

Two Ships sail for one Port at A; the first sails East 335 Miles to B, the Second sails East 14 deg. 40 min. North, 271 Miles to C. I demand how far they are asunder, and what is the Course from the Ship at C, to that at B.

In the Triangle ABC,
There is given,

AB 335
AC 271
} BC required.
CAC 14° 40′

This

This Caſe requires a double Operation
1. By the 3*d*. Caſe to find the Angles
2. By the 1*ſt* Caſe to find the ſide required.

AC 335
AL 271
Sum is 606
Diff. is 64

The firſt Operation.

As the Sum of the Sides AB and AC 606 Miles — Co. Ar. — 7.217528
To their Difference — 64 — 1.806180
So is t. of half Sum Angles — 82° 40′ — 0.890440
To t. half their Difference — 39 22 — 19.914148
By which you will find the Angle ABC, to be 43° 18′

The ſecond Operation.

As S. ABC 43 d. 18 Min. — Co. A. 0.163791
To the Side AC 271 Miles — 2.432969
So is S. BAC 14 deg. 40 min. — 9.403455
To Side BC 100 Miles — 12.000215

The Angle at B is found to be 43 deg. 18 min. therefore the Line AB being Eaſt and Weſt, and the Courſe from C to B is Eaſt 43 deg. 18 min. S. or S E. 1 deg. 42 min. Eaſterly. And the diſtance 100 Miles.

By the Gunter, *for the Angle at* B.

The Extent from 606 Miles the ſum of the ſides, To 64 Miles the Difference of the Sides, will reach from the Tang. of 82d. 40m. half the Sum of the unknown Angles; to the Tangent of 39 deg. 22 min. half their Difference, which being found, proceed as above to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the ſide AC, to 100 Miles ſide BC, as above.

Thus much for ſailing by the *Plain Chart*; which being of ſome Uſe in ſhort Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit it; but nevertheleſs would adviſe all that take Charge of Ships never to content themſelves with the Uſe of the *Plain Chart* only, being ſo apparently falſe in itſelf, and ſo unſafe for Practice: Nor are we under any Neceſſity to truſt to it, the Defect thereof being now ſufficiently ſupplied by Mr. *Wright's* True Chart, commonly called *Mercator's*, the Projection and Uſe of which (both in ſingle Queſtions and Traverſes) is largely treated of and rendered as eaſy as the *Plain Chart*, in the Book called *Practical Navigaion*, firſt ſet forth by Mr. *John Seller*, and now corrected and reprinted for Mr. *Mount* and *Page* on *Tower-hill*, with many uſefull Additions.

A

A Large and very Useful

TABLE

OF

DIFFERENCE

OF

LATITUDE and DEPARTURE

IN

Minutes and Tenth Parts,

to every *Degree* and *Quarter-Point*

OF THE

COMPASS:

For the exact Working

OF A

TRAVERSE:

LONDON: Printed for *William Mount* and *Thomas Page*, at the *Postern* on *Tower hill*.

Diff.	1 Deg		2 Deg		¼ Point		3 Deg.		4 Deg.		5 Deg.	
	Lat	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	49.9	02.8	39.8	03.5
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4
Diff.	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*	*Dep*	*Lat*
	89 Deg.		88 Deg.		7¾ Point		87 Deg		86 Deg.		85 Deg.	

Dist.	1 Deg.		2 Deg.		¼ point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.9	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.1	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.1	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.2	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	03.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	05.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	8.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Dist.	Dep.	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Point		87 Deg.		86 Deg.		85 Deg.		

Diff.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg	
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	0.
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.
3	03.0	00.3	03.0	00.3	03.0	00 4	03.0	00 4	03.0	00.4	03 0	00.5
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.(
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9
7	07 0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06 9	01.1
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01 1	07.9	01.2	07 9	01.3
9	09.0	00.9	08.9	00.9	08.9	01.1	08 9	01.2	08.9	01.3	08.9	01.4
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.8	01.5	09.9	01 (
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10 9	01.6	10.9	01.7
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.8	01.8	11.9	01.9
13	12.9	01.3	12.9	01.4	12 9	01.6	12 9	01.8	12 8	01 9	12.8	02.0
14	13.9	01 4	13.9	01.5	13.9	01.7	13.9	01.9	13 8	02.1	13.8	02.2
15	14 9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3
16	15.9	01.6	15.9	01.7	15 9	01.9	15.8	02.2	15 8	02 3	15.8	02.5
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02 4	16.8	02.5	16.8	02.7
18	17.9	01.8	17.9	01.9	17 9	02.2	17.8	02.5	17.8	02.6	17.8	02.8
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19 8	02.9	19.8	03.1
21	20.9	02.1	20 9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6
24	23.9	02.4	23.9	02.5	23 8	02.	23.8	03.3	23.7	03.5	23.7	03 8
25	24 9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03 9
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04 1
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04 4
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5
30	29 9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04 5	30.6	04.9
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1
33	32 8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2
34	33 8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4
35	34.8	03.4	34 8	03.7	34 7	04.3	34.7	04.9	34 6	05.1	34.6	05.5
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05 1	36.6	05 4	36.5	05.8
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9
39	38 8	03.8	38.8	04.1	38.7	04.8	38.6	05 4	38.6	05.7	38.5	06.1
40	39 8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	49.6	05.9	39.5	06.3
41	40.8	04.0	40.8	04 3	40.7	05.0	40.6	05.7	40.6	06 0	40.5	06 4
42	41.8	04.1	41 8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	6.7
44	43.8	04.3	43.8	04 6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06 9
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44 5	06 6	44 4	07.0
46	45.8	04 5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06 5	46.5	06 9	46 4	07.3
48	47.8	04.7	47.7	05.0	47.6	05 9	47.5	06.7	47.5	07.0	47.4	07.5
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07 3	49 4	07.8
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat
	7½ Point		84 Deg.		83 Deg.		82 Deg		7¼ Point		81 Deg.	

Dist.	¼ Point Lat	¼ Point Dep	6 Deg. Lat	6 Deg. Dep	7 Deg. Lat	7 Deg. Dep	8 Deg. Lat	8 Deg. Dep	¾ Point Lat	¾ Point Dep	9 Deg. Lat	9 Deg. Dep	Dist.
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.1	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		

Diff.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.	
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2
39	38.4	06.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	11.0
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9
50	49.2	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat
	80 Deg		79 Deg.		7 Point		78 Deg		77 Deg.		76 Deg.	

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.5	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.2	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Deg.		79 Deg.		7 Point		78 Deg.		77 Deg.		76 Deg.		

Dist.	1¼ Point		15 Deg.		16 Deg.		2½ point		17 Deg.		18 Deg		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ Point		75 Deg.		76 Deg		6½ Point		73 Deg.		72 Deg		

Dist.	1¼ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55 3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.5	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18 4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63 7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16 3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.5	65.4	18 7	65.1	19 7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18 4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68 9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22 1	72.7	22.2	72.3	23 5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79 4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82 7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84 4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.5	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89 4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30 9	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	6¾ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		

Dist.	19 Deg		1¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.8	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.3	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.2	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg		6¼ Point		70 Deg		69 Deg		68 Deg.		6 Points		

Dist.	19 Deg		1¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.9	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.5	55.4	23.0	60
61	57.7	19.9	57.4	20.6	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23 3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22 2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60 7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62 6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23 6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66 8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.5	27.6	72
73	69.0	23 8	68.7	24.6	68.6	25.0	68 2	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69 5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69 3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28 0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.6	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31 1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.0	28.6	79.9	29.1	79.4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.8	81.2	31.2	80.7	32.6	80.4	33 3	87
88	83.2	28.7	82.9	29.6	82 7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30 0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34 5	85.0	35.2	92
93	88.0	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33 2	90.6	34.8	89.9	36.3	89 6	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90 5	37.5	98
99	93.6	32 2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94 2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		64 Point		70 Deg.		69 Deg.		68 Deg.		6 Point		

Dist.	23 Deg		24 Deg		25 Deg		2¼ Point		26 Deg.		27 Deg		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.7	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	07.0	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	49.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.1	44.8	19.9	44.4	20.7	44.3	21.0	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	20.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.0	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.6	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.4	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.8	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.2	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.4	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.3	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	92.4	42.8	89.9	43.8	89.1	45.4	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg.		66 Deg.		65 Deg.		5¼ Point		64 Deg.		63 Deg.		

Dist.	28 Deg.		2¼ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00 9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02 6	01.5	02.6	01 5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.3	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05 2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04 6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12 0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15 7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16 6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09 4	17.5	09.7	17 3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18 4	10.2	18.2	10.5	18.0	10.8	18 0	10.8	21
22	19.4	10.3	19.4	10 4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20 8	12.0	20.6	12.3	20.6	12.4	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21 6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13,0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12 7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24 9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26 8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28 6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.5	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.6	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18 0	30.9	18.5	30.9	18.5	36
37	32.7	17 4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18 9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35 3	18.8	35.3	18.9	35.0	19.4	34.6	20.0	34.3	206	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19 9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39 4	23.7	46
47	41.0	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40 3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42 0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	23.6	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	1
2	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	2
3	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	3
4	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	4
5	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	5
6	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	6
7	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	7
8	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	8
9	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	9
10	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	10
11	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	11
12	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	12
13	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	13
14	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	14
15	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	15
16	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	16
17	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	17
18	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	18
19	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	19
20	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	20
21	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	21
22	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	22
23	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.5	23
24	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	24
25	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	25
26	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	26
27	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	27
28	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	28
29	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	29
30	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	30
31	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	31
32	72.4	38.5	72.3	38.7	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	32
33	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	33
34	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	34
35	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	35
36	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	36
37	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	37
38	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	38
39	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	39
40	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	45.3	40
41	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	41
42	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	42
43	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	43
44	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	44
45	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	45
46	84.8	45.1	84.7	45.3	84.0	46.5	83.1	48.0	82.3	49.4	82.3	49.4	46
47	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	47
48	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	48
49	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	49
50	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Diff.	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	30.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.6	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	58 Deg		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		

Dist	32 Deg.		33 Deg.		3 Point		34 Deg.		35 Deg.		36 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31 0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.7	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47 0	30.5	46.6	31.1	46 4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30 2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33 5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49 5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31 8	50.3	32.7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51 2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49.3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
65	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55 4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38 0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	8.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41 7	71
72	61.1	38 2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62 8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40 3	63.7	41.4	63.2	42.2	63.0	42 5	62.3	43.6	61.5	44.7	76
77	65 3	40.8	64 6	41.9	64.0	42 8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42 5	64.9	43 3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67 0	41 9	66.3	43.0	55.7	439	65.5	44.2	64.7	45.3	63.9	45.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44 1	67.4	45.0	67.1	45.3	66.4	46 5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	06.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69 6	47 0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72 9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69 6	50.5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70 4	51.1	87
88	74 6	46.6	73.8	47.9	73.2	48.9	73.0	49 2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	48.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77 2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77 1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53 7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54 4	81.2	54.8	30.3	56.2	79.3	57.6	98
99	84.0	52.5	83 0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84 8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	31.9	57.4	80.9	58.8	100
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	58 Deg.		57 Deg.		5 Point		56 Deg.		55 Deg.		54 Deg.		

Dist.	3¼ Point		37 Deg.		38 Deg		39 Deg.		3½ Point		40 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.9	03.1	03.9	03.2	03.8	03.2	5
6	04.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	05.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	06.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.9	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	15.0	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.6	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	39.9	30.1	39.4	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	4¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	3¼ Point		37 Deg		38 Deg.		39 Deg.		3½ Point		40 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31 6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	339	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	35.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47 1	35.5	46 5	35.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48. 3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52 8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	437	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44 5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47 2	58.0	47.6	57.4	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	626	46.5	62.3	46.9	51.5	48.0	60.6	49 1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	52.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	659	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	55.4	51.1	64.5	52.2	54.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50 6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	699	51.8	69.5	52.4	53.6	53.6	67.6	54.7	57.3	55.2	56.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	58.0	55.8	67.4	55.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	59.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69 7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	53.4	70 5	59.1	92
93	74 7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74 3	62.4	97
98	78.7	58.4	78.3	58.0	77.2	60.3	75.2	61 7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76 9	62 3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	4¼ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist.	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg		4 Point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	02.9	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.9	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	49 Deg		48 Deg.		4¼ Point		47 Deg.		46 Deg		4 Point		

Dist.	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg.		4 Point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.9	36.1	36.1	51
52	39.2	34.1	38 6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38 1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40 9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38 2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	41.3	57
58	43 8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38 7	43 8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	42.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	43.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43 9	42.4	43.1	43 1	61
62	46 8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.0	43.1	43.8	44.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43 8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	45.1	49 6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50 4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51 4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51 0	55.6	51.8	54.7	52.8	53 7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52 5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58 5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59 3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66 9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68 9	62.5	68 0	63.4	66.9	64.6	65 8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62 3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	06.8	70.5	68 1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Point		

The Uſe and Explanation of the Table of Difference of Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, and to any Diſtance not exceeding 100 Miles to every Degree and Quarter-point of the Compaſs; and may be uſed to a greater Diſtance being taken out at twice or thrice according to the Quantity of the Diſtance as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Degree and Quarter-point of the Compaſs; at the Head it begins at 1 deg. ſo 1 deg. $\frac{1}{4}$ point, *&c.* encreaſing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, ſo 46 deg. 47 deg. $4\frac{1}{4}$ Points, *&c.* encreaſing backwards to 90 deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns under the Title *Diſt.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100. the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The USE of the Table.

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe*.

Example 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſails NNE. $\frac{3}{4}$ E. 95 Miles, and the Difference of Latitude and Departure required.

On the Right hand Page (becauſe the Diſtance is above 50) and at the top (becauſe it is leſs than 4 Points) look for 2 $\frac{3}{4}$ Points, which is the Courſe under which, and againſt 95 the Diſtance, and under the Title *Lat.* ſtands 81.5, which is 81min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* ſtands 48.8, which is 48min. $\frac{8}{10}$ which is the Departure required.

Example 2. Suppoſe a Ship ſails South 56deg. Weſterly 48 Miles, the Difference of Latitude and Departure required.

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the bottom (becauſe it is more than 45d.) look for 56d. the Courſe; over which, and againſt 48 the Diſtance, over the Title *Lat.* ſtands 26.8, that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8, that is 39min. $\frac{8}{10}$ the Departure required.

Example 3. Suppoſe a Ship ſail North Weſt by North 160 Miles, what the Difference of the Latitude and Departure required by the Table.

On the Right-hand Page at the top, look for 3 Points, the Courſe. Now becauſe the Table goes but to 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 5[illegible]

t is 55min. $\frac{6}{10}$ the Departure, then for 60 under 3 Points, and againſt under the Title *Lat.* ſtands 49.9, that is 49min. $\frac{9}{10}$ the Diff. of Lati-de, and under the Title *Dep.* ſtands 33.3, that is 33min. $\frac{3}{10}$ the Depar-re, then add the Difference of Latitude and Departure for 60, to the fference of Latitude and Departure for 100, the Sum is 133 min. the fference of Latitude, and 88 $\frac{8}{10}$ the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems *Plain Sailing*, which for Brevity ſake are omitted here, being taught at rge, in the laſt Edition of *Practical Navigation*; but the general Uſe of is in the exact working of a Traverſe:

Example 1. Suppoſe a Ship bound to a certain Port, ſails S E. by S. 9 min. then ESE $\frac{1}{2}$ E 52 min. then E by N $\frac{1}{2}$ E. 62 min. then SSW $\frac{1}{2}$. 57 min. then S $\frac{1}{2}$ E. 39 min. to find the Difference of Latitude and eparture the Ship hath made.

Set down the ſeveral Courſes and Diſtances; firſt allowing for Leeway any; then proceed to look out the Difference of Latitude and Departure r each Courſe and Diſtance (by the Directions before given in the Ta-le placing them in their proper Columns, (*viz.*) If the Courſe be Nor-herly, the Difference of Latitude muſt be put in the North Column, if erly, in the South Column; If the Departure be E.erly, it muſt be put the Eaſt Column; if W.erly in the Weſt Column, as was before di-ected: Then having framed the Table, add up the Columns of Diffe-ence of Latitude and Departure, and ſubtract the leſſer Difference of atitude and Departure from the greater, and the Remainder is the Dif-erence of Latitude and Departure.

The Table.

Courſe.	*Diſtances*	*Diff. of Latitude*		*Departure.*	
		North	*South*	*Eaſt*	*Weſt*
S E by S	49		40.7	27.2	
ESE $\frac{1}{2}$ E	52		15.1	49.8	
E by N $\frac{1}{2}$ E	62	06.1		61.7	
SSW $\frac{1}{2}$ W	57		50.3		26.9
S $\frac{1}{2}$ E.	39		38.8	03.8	
		06.1	144.9	142.5	26.9
			06.1	26.9	
			138.8	115.6	

The whole Diff. of Lat. is 138 $\frac{8}{10}$ S. the Dep. 115 $\frac{6}{10}$ E. then to find the Courſe and Diſt. find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4 and half the Dep. 57.8 the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which, at the Top I find 3 $\frac{1}{2}$ Point for the Courſe South Eaſterly, or SE $\frac{1}{2}$ S. and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example

Examp. 2. The Courses being given in Deg. which often happens by reason of Allowance for the *Variation of the Compass*, and in the like Cases.

Suppose a Ship bound to a certain Port, sails 65 Miles North, 34 deg. Westerly. Then 56 Miles North, 67 deg. Westerly. Then 48 Miles South, 78 degrees Westerly. Then 54 Miles North, 23 deg. Easterly. Then 36 Miles North, 6 deg. Easterly, and the Difference of Latitude and departure required.

The Table.

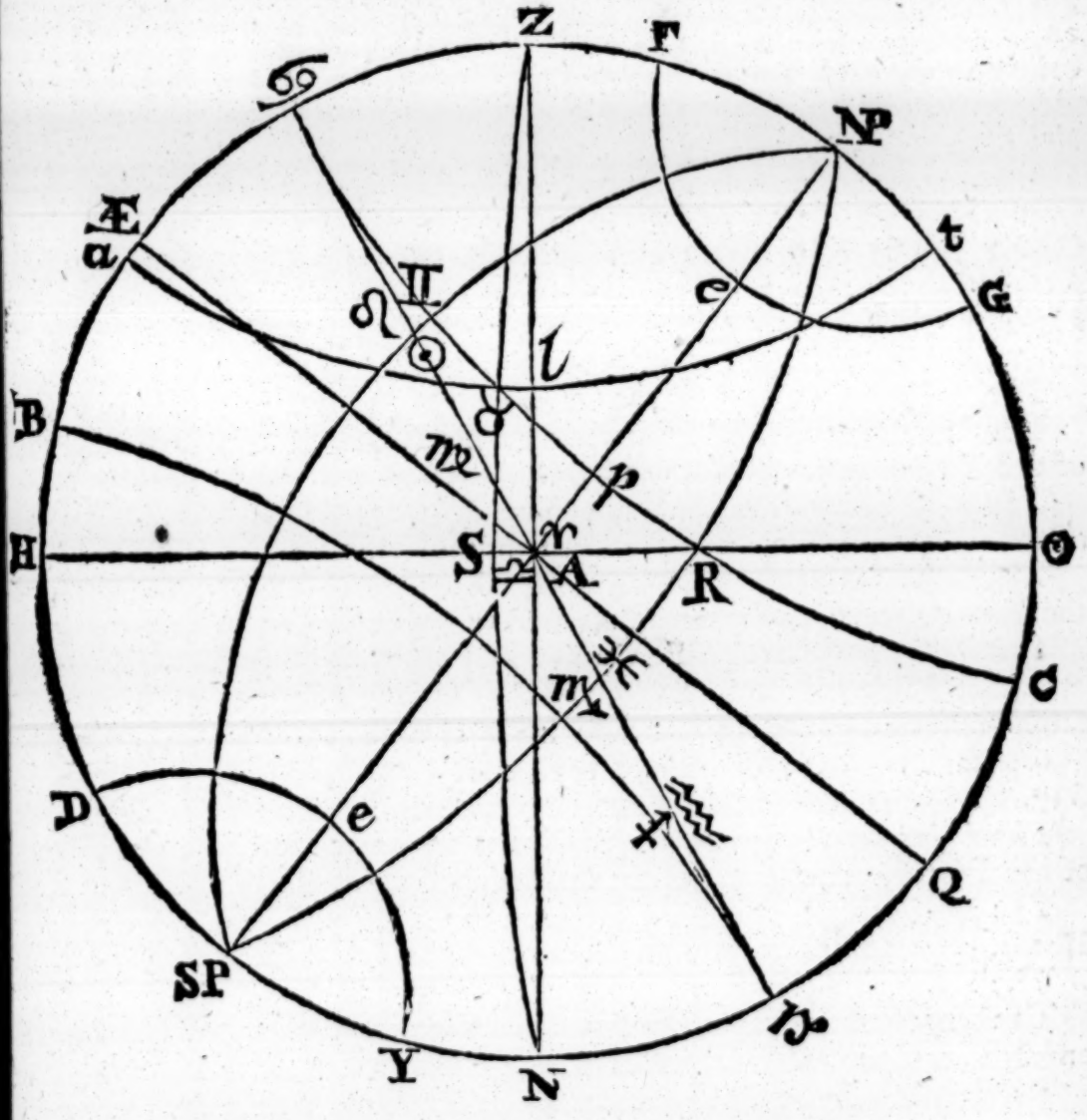
Course.	Distances	Diff. of Latitude North	Diff. of Latitude South	Departure East	Departure West
N W 34°	65	53.9			36.3
N W 67°	56	21.9			51.5
S W 78°	48		10.0		47.0
N E 23°	54	49.7		21.1	
N E 6°	36	35.8		03.8	
		161.3	10.0	24.9	134.8
		10.0			24.9
		151.3			109.9

The whole Difference of Latitude is 151 $\frac{3}{10}$ N. the Departure 109 $\frac{9}{10}$ West. The Course and Distance is found as in the last Example.

But if you would keep a Reckoning both in Latitude and Longitude you may also find the Difference of Longitude by the *Traverse Table*, (according to *Middle Latitude* Sailing) thus: Find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure; find your Departure, and right against that, in the Column of Distance, you have the Difference of Longitude.

Exam. Suppose in the last Instance of a *Traverse*, the Ship hath sailed from Latitude 50 deg. 00 min. North; then because the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is, 52 deg. 31 min. and consequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding so far, I take its half, *viz.* 55, the neareſt to which in the Table, is 54.8 (being less) against which, in the Column of Distance is 87, which doubled (because I took half the Departure) the Sum 174 min. or 2° 54′ is the Difference of

Longitude required, which is ſufficiently exact for common Practice; only I would adviſe all Perſons for avoiding as much as poſſible any Error, that every Time the Reckoning is Corrected by an Obſervation, the Longitude be alſo Corrected according to *Mercator's* Sailing, as you are taught in the laſt Edition of Practical Navigation.



Some neceſſary Aſtronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World, are two fixed Points in the Heavens, oppoſite one to another; the one viſible to us, called the North Pole, marked with the Letters N.P; the other not viſible to us, called the South Pole, marked with S.P.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed the diurnal Revolution, as the Line NPASP.

The *Equinoctial* is a great Circle 90 deg. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſphere; it is noted by the Letters ÆAQ.

The *Ecliptick* is a great Circle interſecting the Equinoctial in two oppoſite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈	called Northern Signs	*Libra*	♎	called Southern Signs
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptick* is noted by the Characters of the twelve Signs, as above.

The Poles of the *Ecliptick* are two Points 23 deg. 29 min. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiack* is a Zone, having about 8 degrees of Breadth on either ſide of the Ecliptick, and Limits the Latit. of the Planets in their Revolutions.

The *Meridians* are great Circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as N P R S P.

The *Tropicks* are two ſmall Circles 23 deg. 29 min. diſtant from the Equinoctial being paralled thereto, and limits the Sun's greateſt Declination; the North Tropick being marked with ♋ C, called the Tropick of *Cancer*; the South Tropick called the Tropick of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two ſmall Circles 23 deg. 29 min. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens, directly over our Heads, *viz.* 90 degrees diſtant from the Horizon, as Z.

The *Nadir* is the Point diametrically oppoſite to the Zenith, as N.

The *Azimuths* are great Circles interſecting each other in the Zenith and Nadir, and cutting the Horizon at Right Angle, Z S N.

The *Horizon* is a great Circle 90 deg. diſtant from the Zenith and Nadir, and divides the World into the viſible and inviſible Hemiſpheres as HAO.

The *Meridian* of a Place, is that Meridian that paſſeth by the Zenith and the Nadir of the ſaid place, and is repreſented by the Circle Z N P O Q N S P H Æ Z.

Parallels of Altitude, or *Almicanters*, are ſmall Circles paralled to the Horizon, imagined to paſs through any Degree of Altitude between the Horizon and the Zenith, as a l t.

Parallels

Parallels of Declination, or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ☌ PRC.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptick, and is accounted either Northerly or Southerly.

The *Longitude* of a Star, is an Arch of the Ecliptick, contained between the Circle of Longitude paſſing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star, is an Arch of the Meridian, contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Aſcenſion* is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Aſcenſion is the Degree and Minute of the Equinoctial, that riſeth with the Center of the Sun or Star.

Oblique Deſcenſion is the Degree and Minute of the Equinoctial, that ſets with the Center of the Sun or Star.

Aſcenſional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Deſcenſion, or Aſcenſion, or it is the Difference of Time between the Sun Riſing or Setting, and Six a Clock.

The *Amplitude*, is an Arch of the Horizon, being the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt or Weſt, and is accounted either Northerly or Southerly.

The Latitude of a place, is the height of the Pole above the Horizon, or the Diſtance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other place, and is accounted Eaſterly and Weſterly.

Aſtronomical Problems uſeful in Navigation.

PROBLEM I.

THE Sun's Place and greateſt Declination given, to find its preſent Declination.

Example.

Suppoſe the Sun's Place to be 20d. 30m. of *Gemini*, the greateſt Declination is 23d. 29m. it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.000000
is to S. Sun's greateſt Declination 23d. 29m.	9.600409
ſo is S. Sun's Longitude 80d. 30m. from *Aries*	9.994003
To S. Sun's preſent Declination 23d. 9m. North	19.594412

By the Gunter.

The Extent from Radius S. 90°, to S. 23° 29′, ſhall reach from S. 80° 30′ to the S. 23° 10′ the Sun's *Declination* North becauſe in a Northern Sign.

Note; The Sun's Long. is rekoned from the next Equinoctial Point, Therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus* *Aquarius*, or *Piſces*, the Longitude is accounted from *Aries*; but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs; *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, and *Piſces*, are called Southern Signs. Conſequently, if the Sun's place be in any of the firſt ſix Signs the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declnation and preſent Declination given, to find his Place.

The Sun's greateſt Declination is 23° 29′; and preſent Declination is 18° 30′ North increaſing, the Sun's Place required.

By the Logarithms.

As the S. of the Sun's greateſt Declination 23° 29′	9.600409
To Radius.	10.000000
So is the Sine of the preſent Declination 18° 30′ North	9.501476
To the Sine Sun's Longitude 52° 46′	9.901067

That is one Sign (30° making a Sign) and 22° 46′ from *Aries*; becauſe the Declination is North and increaſing, that is 22° 46′ of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7° 14′ in *Leo*.

By the Gunter.

The Extent of the Compaſſes from the Sine 23° 29′ the greateſt Declination, to Radius S. 90° ſhall reach from S. 18°. 30′, the Sun's preſent Declination, to S. 52° 46′ the Sun's Longitude as above.

PROB. II.

The Sun's Place and greateſt Declination given, to find the Right Aſcenſion.

Eample

The Sun's place 10° 30′ in *Aquarius*, and the Right Aſcenſion required.

The Operation by the Logarithms

As Radius	10.068501
To the Tangent of the Sun's Longitude from *Aries* 49° 30′	10.068501
So is the Sc. of the greateſt Declination 23° 29′	9962453
To the Tangent of the Sun's Right Aſcenſion 47° 2′	10.030954

By the Gunter.

The Extent from Radius S. 90° to Sc. of the greateſt Declination 66° 31′ ſhall reach from Tangent Sun's Longitude from *Aries* 49° 30′ to Tangent Right Aſcenſion 47° 2′ required.

Note,

Note; This Proportion gives the Sun's Right Aſcenſion from the next Equinoctial Point; but it ought to be accounted from *Aries*, according to the Order and Succeſſion of the Sign, and therefore in this Caſe 47° 02′ ſubtracted from 360d. gives 312d. 58m. the Right Aſcenſion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As Sc. of the Latitude 51d. 32m.	9.793832
To Radius	10.000000
So is S. of the Declination 15d 20m. North	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	9.628486

By the Gunter.

The Extent from the Sc. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, ſhall reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North as above.

Note; If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is alſo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51 deg. 32 min. North, the Sun's Declination 10 deg. 45 min. North, and the Aſcenſional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51 deg. 32 min.	9.900085
To Radius	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	9.278424
To S. of the Aſcenſional Difference 13° 50′	9.378339

By the Gunter.

The Extent from Tangent 38° 28′ (the Comp. of Latitude) to Tangent 10 deg. 45 min. the Sun's Declination, ſhall reach from Radius S. 90d. to 13 deg. 50m. the Sun's Aſcenſional Difference, as above.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, Find the Aſcenſional Difference by the fifth Problem.

Secondly, the Right Aſcenſion by the third Problem.

Then

Then if the Sun's Declination be North, the Ascensional Difference subtracted from the Right Ascension, gives the Oblique Ascension, and added thereto, gives the Oblique Descension. But if the Sun's Declination be South, the Ascensional Difference added to the Right Ascension, gives the Oblique Ascension, and substracted gives the Oblique Descension.

Note, That if the Asensional Difference exceed the Right Ascension, add to the Right Ascension 360 Degrees, then subtract the Ascensional Difference therefrom.

Or if both being added together exceed 360d. the Excess is the Oblique Ascension or Descension.

PROB. VII.

To find the time of the Sun's rising and setting, and length of the Day or Night.

Find the Ascensional Difference by the fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 deg. to the Equinoctial one Hour, and for every degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

If the Sun's Declination be Northerly, the Ascensional Difference added to six Hours, gives the Time of Sun setting, and substracted is the Time of Sun rising.

If the Declination be southerly, contarily the Ascensional Difference added, gives the time of Sun-rising; substracted is the time of setting.

The Time of Sun-setting doubled gives the Length of the Day; the Time of Sun-rising doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, suppose the Sun's Declination 21d. 57m. North, the Ascensional Difference is 30d. 29m. which reduced into Time is

	H. M.		H. M.	
	2 02			
	6 00			
Sun setteth ——	8 02	doubled is	16 04	length of the Day.
Sun riseth ——	3 58		7 56	length of the Night.

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth required.

The Rule.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination to 90 deg. add them together and take the Half Sum; substract the Compl. of the Declination from the half Sum, and take the Remainder; then set down the Compl. Arithmetical of the Sine of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the Half-sum and Remainder, half the Sum of these four Logarithms is the Sc. of half the Azimuth required. *Note*

Note; If the Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, and then proceed as before.

The Operation by the Logarithms.

c	′		
42	: 30	Compl. Altitude	S. Co. Ar. 0.170317
38	: 28	Compl. Latitude	S. Co. Ar. 0.206168
69	: 30	Compl. Declination	
150	: 28	Sum	
75	: 14	Half Sum	S. 9.985414
5	: 44	Exceſs of the half ſum above c. Decl.	S. 8.599599
			Sum 10.301458
			Half Sum 9.080729

61d. 21m. — Sc. —

61d. 21m.

Which doubled is 122d. 42m. the Sun's Azimuth from North required.

The Operation by Gunter's *Scale.*

The Extent of the Compaſſes from Radius S. 90 deg. to S. 42 deg. 0 min. the Complement of the Altitude, ſhall reach from S. 38d. 28m. the Complement of the Latitude, to S. 24 deg. 40 min. then the Extent from Sine 24 deg. 40 min. to Sine 75 deg. 14 min. the half Sum, ſhall reach from Sine 5 deg. 44 min. the Exceſs of the half Sum, above the Complement Declination to 122 d. 42 min. (upon the Line of Verſed Sines) which is the Azimuth required.

Examp. 2. In the Latitude of 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South his Altitude 17 deg. 45 min. and the Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
72	: 15	Compl. Altitude	S. Co. Ar. 0.021182
38	: 28	Compl. Latitude	S. Co. Ar. 0.206168
108	: 15	Declination 90 deg. being added, becauſe South.	
218	: 58	Sum	
109	: 29	Half ſum Compl. to 180° is 70° 31′	S. 9.974381
1	: 14	Remainder	S. 8.332924
			Sum 18.534655
			Half ſum 9.267327

79 : 20 — Sc. —

79 : 20

Which doubled is 158 : 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Compl. Altitude, ſhall reach from the S. 38d. 28m. the Complement Latitude, to the 36d. 20m. then the Extent from the S. 36d. 20m. to S. 70d. 31m. the Complement of 109d. 29m. (the Half Sum) to 180d. ſhall reach from the Remainder S. 1d. 14m. to 158d. 40m. (upon the Line of Verſed Sines) the Sun's Azimuth as above.

In

In South Latitude, the Operation is the same with the two preceding Examples, only the Azimuth is found from the South.

After the same manner you may find the Azimuth of any Star.

PROB. IX. The Latitude of the place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min. North, suppose the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90°, add them together, and take the half sum, subtract the Complement of the Altitude from the half Sum, and take the Remainder, then set down the Complement Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder: half the Sum of these four Logarithms, is the Sc. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by the Logarithms.

d.	m.			
66	: 31	Compl. Declination	—— S. Co. Ar.	0.03754
38	: 28	Compl. Latitude	—— S. Co. Ar.	0.20610
53	: 30	Compl. Altitude		
158	: 29	Sum		
79	: 14	Half Sum	—— Sine	9.99228
25	: 44	Remainder	—— Sine	9.63767
			Sum	19.18367
		d. m		
		30 09	—— Sc.	Half sum 9.93683
		30 09		

Which doubled is 60 18 and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Hour of the Day Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ subtracted from 12 hours leaves 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem; do the same when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compasses from Radius S. 90° to S. 66° 31′ the Complement of the Declination, shall reach from S. 38° 28′ the Complement Latitude, to S. 34° 40′; then the Extent from S. 34° 40′ to the S. of 79° 14′, the half sum shall reach from S. 25° 34′ the Remainder, to 60° 15′ (upon the Line of Versed Sines) the hour of the Day near as above.

PROB. X. Having the Latitude of the Place, the Sun's Right Ascension, with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Exampl

Example.

In the Latitude of 51 deg. 32 m. North on the 7th of *January*, 1733, the Sun's Right Aſcenſion is 20 hours 1 min. the Right Aſcenſion of the Moon's *Tail* is 11 hours 31 min. the Declination 16 deg. 10 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the hour of the Night required.

The Rule.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, ſubtract the Complemement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of theſe Four Logarithims, is the Sc. of half the Diſtance from the Meridian.

The Operation by the Logarithms.

°	′		
73	50	Compl. Star's Declination S. Co. Ar. ——	10.017596
38	28	Compl. Latitude — —— —— S. Co. Ar.	0.206168
50	30	Compl. Star's Altitude.	
171	46	Sum	
85	53	Half Sum —— —— —— Sine —	9.998878
26	23	Remainder —— —— — Sine —	9.647749
			Sum 19.870291
	30d. 32m.	—— Sc. ——	Half Sum 9.935145
	30d. 32m.		

Which doubled is 61d. 04m. and reduced into Time, gives four Hours, four Minutes, 16 Seconds, or $\frac{1}{4}$ of a Minute.

By the Direction given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the Fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian, ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but if the Star be to the Weſtward of the Meridian, add the Star's Diſtance from the Meridian, to the Time of the Star's coming on the Meridian; the Sum or Difference is the Hour of the Night. In this Example, the Sun's right Aſcenſion 20 Hours 01 Minute ſubtracted from the Stars Right Aſcenſion (with 24 Hours added thereto) 35 Hours 31 Minutes; leave 15 Hours 30 Minutes, the Time of the Stars coming on the Meridian; from which Subtracting 4 Hours 4 Minutes leaves 11 Hours 26 Minutes; the Hour of the Night.

Note farther, If the *Star's* Declination be South in North Latitude, o North in South Latitude, inſtead of taking the Complement Declination to 90 deg. there muſt be 90 deg. added thereto, as has been ſhewn i the Eighth preceding Problem.

The Operation by Gunter's Scale.

The Extent of the Compaſſes from Radius S. 90° to the S. of 73 De grees 50 Minutes the Complement of the Star's Declination, ſhall reac from S. 38 Degrees 28 Minutes the Complement of the Latitude, to th S. of 36 Degrees 40 Minutes; then the Extent from S. 36 Degrees 4 Minutes, to S. 85 Degrees 53 Minutes the half Sum, ſhall reach from 26 Degrees 23 Minutes the Remainder, to 61 Degrees 05 Minutes (upo the Line of verſed Sines required.) With which proceed as has been direc ed to find the Hour of the Night.

Courſes and Diſtances between ſome of the moſt eminent Places on th Coaſt of England, *&c. As alſo the thwart Courſes between the Ea Coaſt of* England *and* Holland, *the South Coaſt of* England, *an* France, *and the Weſt Courſe of* England *and* Ireland.

	Lea
FROM *Whitby* to *Tinmouth*, N W by N	1
From *Bockneſs* to *Catneſs*, North Weſt	2
From the *North Foreland* to *Fluſhing*, Eaſt	2
From the *North Foreland* to the *Texel*, North Eaſt	5
From the *Spurn* to the *Texel*, Eaſt by South	8
From *Tinmouth* to the *Naze* of *Norway*, N E by E.	12
From *Tinmouth* to *Holy Land*, Eaſt by South	11
From *Tinmouth* to the *Scaw*, E N E	11
From *Yarmouth* to the *Texel*, Eaſt by North	3
From *New Caſtle* to *Maes Deep* ENE.	8
From *Aberdeen* to *Maes Deep*, South Eaſt	11
From the *North Foreland* to the *Maes*, E N E	3
From *Newcaſtle* to the *Fly*, ESE	6
From *Scarborough* to *Holy Land*, Eaſt Northerly	8
From the *Start* to the *Eddyſtone*, Weſt half South	8
From the *Lands End* to *Silly*, Weſt South Weſt ¾ Weſt	6
From the *Gaſkets* to *Blackneſs*, Eaſt North Eaſt	8
From *Beachy* to *Blackneſs*, Eaſt a quarter North	8

Fro

From *Dover* to *Diep*, South half Weſt —— 25
From the *Lizard* to *Guernſey*, Eaſt by South —— 35
From the *Start* to *Seven Iſles*, South half Eaſt —— 25
From *Silly Uſhant*, S E by S —— 35
From the *Lizard* to *Uſhant*, South —— 27
From *Hartland Point* to the Iſland of *Londey*, North —— 03
From *Londey* to the *Holms*, Eaſt by North —— 18
From *Black Rock* to *Tuſcar*, Eaſt North Eaſt —— 03
From *Cape Clear* to *Old Head*, Eaſt by North —— 13
From *Greſholm* to *Waterford*, Weſt by North —— 21
From the *Land's End* of *England* to *Tuſcar*, North by Weſt —— 40
From the *Land's End* of *England* to *Waterford*, North North Weſt —— 40
From *Holy Head* in the Iſland of *Angleſey*, to the Bar of *Dublin* W by N 18½
From *Rockel* to *Black Rock*, South by Eaſt —— 80
From the *Land's-end* of *England* to *Cape Clear*, North Weſt by Weſt —— 35
From the *Lands-end* of *England* to *Old-head*, North Weſt —— 35

A Table of the Soundings coming into the Channel, *reſpecting the Bearing and Diſtances of* Silly, Uſhant, the Lizard, *&c. with the Depth in Fathoms and the various ſorts of Ground.*

Bearings	Dift.	Lat. D.	Lat. M.	Dep.	*The various ſorts of Ground.*
South	05	50	20	50	Branny ſand, like Ground Wheat
S S E	05	50	12	45	White ſand mixed with ſhells
S S E	06			50	Coarſe Owſe
E S E	06			53	Coarſe ſand and fine red ſhells
E by S	08	50	12	78	Owſe ſand, with Queen ſhells amongſt it
E by N	07	49	15	72	Owſe like Muſtard Seed, with broken ſhells
E by N	15	48	50	72	Pepper ſand, black and yellow
E by N	24	49	50	72	Black, white, and red ſtones with Owſe
E N E	07	49	15	60	Some black Sand
E N E	20	49	15	80	Rocky Ground
E N E	55			103	Fine white ſand
N E by E	22	49	10	85	Sand and owſe together
N E by E	10	49	20	55	White and red ſand mixed with ſhells
N E by E	50	49	50	100	White ſand with Owſe and Nits
N E by E	25	49	50	64	Branny ſand, with white and red ſhells
N E by E	06	49	10	48	Black ſand
N E by E	13	49	43	65	Branny ſand with ſome pieces of ſhells

	Bearings.	Dist.	Lat. D. M.	Dep.	*The various Sorts of Ground.*
Silly	North East	10	49 40	65	Branny ſand, ſmall ſtones, Herring Bo
	NE by N	10	49 20	57	Small red ſand
	NNE	10	49 47	100	White ſand then entring on the Bank
	N by E	18		68	Red ſand, with black and white *Scollop-ſh*
	North	12	49 15	65	Broken ſhells with white and red ſand
	North	10	49 47	65	White ſand on the E. part of the Bank
	NNW	33	48 52	77	Red ſand and ſhells amongſt it
	NW by N	07	49 40	54	More ſhells, the *Lizard* N.E. diſt. 18 le
	North Weſt	04	50 10	50	Branny ſand with black and broken ſhel
	North Weſt	07	49 47	60	Stony Ground
	NW by N	04	50 25	61	Red & black ſand, with gliſtering ſhells
	NW by W	2½		44	Shells & ſand like the points of Needles
	W by N	13	50 25	63	Fine white Sand, with a little owſe
	Weſt	21	50 08	60	Red & black Sand, with gliſtering ſhells
	W by S	32	49 50	75	Fine white ſand, and gliſtering ſhells
	W. by S	3½		40	Like broken Wheat or Coarſe Bran
Uſhant	North	06	48 36	63	Full of ſmall Mace ſand
	N. by E.	18	48 15	80	Round ſtones mixed with Scollop ſhells
	N.E. by N.	11		60	Small beaten ſhells and Hakes Teeth
	North East	25	48 50	85	Great and ſmall peices of Cockle ſhells
	North East	25	48 10	55	Gray and brown Sand with white ſhells
	N.E. by N.	07	48 30	68	White and gray mace Sand
	ENE	14	48 36	68	Small ſhells and Herring Bones
	E by N	25	48 30	85	White & gray Sand with ſmall red ſtones
	East	18	49 00	70	Branny Sand, with ſome ſhells
	East	06	49 00	65	Red ſand, ſhells things like Needle point
	East	15	49 15	70	Fine white Sand
	East	33	49 15	87	Dazling Sand like Barley ſtraw
	East	04	49 10	60	Full of Mace Sand and broken ſhells
	E by S.	04	48 56	63	Shells like Perriwincles
	ESE	15	49 15	70	Shells gray & red pieces of Cockle ſhells
	ESE	12	49 20	68	Groſs white ſand with ſhells
	ESE	08	49 05	64	White ſhells and fine ſmall Stones
	ESE	0		60	Hakes teeth & ſhells like oatmeal Husks
	SE by E	20	49 15	72	Great ſtones like Peaſe and Beans
	SE by E	09	49 15	65	Sand and ſome Shells
	SE by E	37	48 30	65	James's ſhells
	SE by E	15	49 25	60	Small Scollop ſhells with ſome Stones

	Bearings	Dist.	Dep.	*The various ſorts of Grounds.*
Lizard	North East	6½	43	Marſhy ſhells and ſome Scollop ſhells
	NE by N	10	52	Marſhy ſhells and Hakes Teeth
	NNE	09	50	Marſhy ſhells like Oatmeal Huſks
	N by E	15	58	Marſhy ſhells and Hakes Teeth
	North	01	39	Stones as big as Beans four Leagues off
	North Weſt	05	45	Gray ſand like Oatmeal Flower
	North Weſt	03	40	Marſhy ſhells and ſmall ſtones
	W N W	3	47	Small ſhingly ſtones, and marſhy ſhells
	W by N	04	40	Fine marſhy ſhels and white ſtones
	W by S	03	41	Black gravelly Ground with ſmall ſtones
	N E by E	12	57	Scollop ſhells
	N E by E	04	44	Great ſtones and rough Ground
	North East	6½	50	Like Husks of Oatmeal and ſmall ſtones
Eddyſtone	S ½ Mile		35	Dirty brown ſand and Hakes Teeth
	W 2 Miles		34	Dirty brown ſand
	S 1 Mile		26	Fine ſand, and within this 28 and 30 Fath
Start	N by E N 1y	8½	40	Like the Duſt of a Grindſtone, with Hakes Teeth and ſhells.
	N W by W	4½	43	
	N W by N	03	38	Gravelly ſand, ſmall ſtones and ſhells
	N by W W 1y	12	38	Reddiſh ſhells maſhed as if beat in a Morter, white ſand and ſcollop ſhells
	N W by W	14	43	
Foreland	N E by E	08	35	Small ſhingly ſtones, as big as Peaſe
	North	08	40	Streamy Ground with ſmall ſtones
	N by E	5½	33	The ſame with ſome black Sands
	N E by N	11	41	Fine Sand, and Scollop ſhells
	N N E	08	40	Fine Sand, Scollop ſhells and ſmall ſtones
	N E by E	2½	27	Shingle Ground
	W N W	2½	20	Small ſtones
Needles	N E by E	02	17	Great Shingly Ground
	N E ½ E	2½	15	Small Shingly Ground
	North East	02	13	Rocky Ground
I. Wight	N by W	3½	20	All the Ground from *Albions* to the E. end of the *Wight* as Chalky, and brown ſand
	E by N	04	21	
	N by E	03	18	
Dunnos	W by S	04	16	Rough Ground with ſome big ſtones
	Weſt	04	21	A kind of ſandy fiſhy Ground
	W N W	08	33	Fiſhing Ground ſomewhat red, with ſtones as big as Peaſe, and ſmall as Beans
	N by W	06	26	

Directions

Directions to ſail into ſome of the Principal Harbours on the Coaſt of *England*.

Directions to ſail into Silly.

SILLY is divided into divers Iſlands; along the Weſt ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt, called St. *Mary*'s Sound is the beſt, being a fair opening of the Channel, but near the midſt lie two ſunken Rocks, which in foul Weather, the Sea may be ſeen to break over: It is beſt to leave them on the Larboard ſide going in, and on the Starboard ſide coming out: Go ſo near the Starboard ſhore, as that a Stone might almoſt be thrown on ſhore. and when you are within the Point, luff up round, and come to an Anchor in the ſight of the Houſes; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard ſide.

To ſail into Foy.

Foy may be very eaſily known lying in between two high Lands; on the W. ſide of the going in, is an old Church and Caſtle, and on the E. ſide the Ruins of an old Church. The going in is a Mile and a half in Length from ſide to ſide, and no Danger; when you are in, you may anchor before the Town, or run up above the Town. This Place lieth N.E. and S.W. in and out, which makes it a better Out-let to the Weſtward than *Plymouth* or *Falmouth*: There is 3 Fath. at low-water at Spring Tide. Here you may lie aſhore to Waſh, Tallow and ſtop Leaks; The Spring Tides riſe and fall 16 and 17 Foot, and it is high Water here at Full and Change half an Hout paſt 5. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land called *Pendennis* Caſtle. In the Entry neareſt the ſaid W ſide lieth a Rock above Water, you may ſail in at either ſide of it, a the inner ſide of the Eaſt point lie alſo ſome Rocks off the ſhore; on th Eaſt ſide is deepeſt Water and moſt Room, therefore in going in, give th Eaſt Point a large Birth; there will be 7 or 8 Fathom. Keep the ſai ſhore till you come within St. *Maude*'s Caſtle; which when it bears Ea there will be 16 or 17 Fathom; but half the Harbour over towards *Smit ick* is but 4 or 5 Fathom, obſerve in going in to keep the *Manac* open and ſhut on the Point of *Falmouth Caſtle*; and ſo it muſt be kept t you ſhut the Church over *Penny Comquick*, into the North Eaſt end of th *Smithick*, and ſo bear over to St. *Maudes* and ride with the Caſtle Ea laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in 4 f thom, as ſhalll ſeem convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth-ſound* lieth an high round Rock ca led *Mewſtone*; between it and the *Ramhead* lieth the ſaid *Sound*. Nor North Eaſt, being round and deep.

A little to the Northward of *Rambead*, is a fair Sand Bay, where is good Anchoring cloſe under the Land, in 9 or 10 Fath. South, a little Eaſterly from *Rambead*, lies a Rock above Water called the *Eddyſtone*, the Point of *Plymouth* lieth from it N. by E. diſtant about 4 Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas*, or *Drake Iſland*, which is joined to the Weſt ſide, with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt ſide with the Land of *Plymouth*, till *Catwater* open on the Starboard ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the Point on the Starboard ſide, leaving moſt part of the Channel on the Starboard ſide, until you come within the Point, and Anchor there right againſt the high ſteep Northern Land; there is at low Water, with extraordinary Tides 4 and 5 Fathom.

In ſailing into *Catwater*, beſure to give a good Birth to the ſouthern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about 2 Cables length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about 12 Foot Water at half Flood, which Buoy muſt be left on the Starboard ſide going in, and when *Catwater* is altogether open you may run in to the Eaſtward, leaving in the Entry of the Harbour two thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the South Shore is ſomewhat flat off, there lying a ſandy Bank, which reacheth to the ſecond Point of the South Shore of *Catwater*.

A little to the Eaſtward of *Drake Iſland*, lies a Rock under Water, upon which at low Water, it is not deeper than two Fathom. To ſail within the Land you may go to the Eaſtward or Weſtward of the Rock, as occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each ſide of the Haven, ſtandeth a little Caſtle; on the Weſt ſide is a Church on the high Land, called St. *Patrick's* Church. To ſail in coming from the Weſtward, run in along by the Weſt Land, ſo far to the Eaſtward until the Key of the Village (on the Eaſt ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands; it is convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to row in. Being come in, edge over to the Weſt ſide before the Brewhouſe, and anchor there in 10 or 11 Fath. or before the Village on the Eaſt ſide at pleaſure. At the Eaſt ſide lieth a ſunken Rock, to avoid which ſteer in with St. *Patrick's* Church, and do not bring the Village, which ſtandeth on the Weſt ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt ſide of the Chappel always in ſight, without the Bulwarks on the North ſide by St. *Patrick's* Church; then there is no danger of the Rock, in the Range

by

by the North point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt point of the *Berry* S. by E. or S.S.E. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Landlockt for a S. and S.W. Wind. At the North Eaſt end of the Bay is alſo a Tide Haven called the *Tormain*; before it is a very good anchor Ground in 4 or 5 Fath. according as you deſire to be nearer or farther from the ſhoar.

Directions for ſailing in at the Eaſt end of the Iſle of Wight *to* Portſmouth Harbour *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight*, or *Portſmouth*; after you come to the Weſtwards of the ſhoal called the *Owers*, hale in North Weſt with St. *Hellens* Point; but do not hale too much to the Northwards, for there lies a Bank off of *Long ſtone* Haven, to the Eaſtward of the *Horſe*, that hath not above 13 Foot on it at low Water; but keeping in 7 or 8 Fath. carrieth you clear without it, and will bring you to the S.E. end of the Sand called the *Horſe*. St. *Hellen* Church being SW. by W. from you, you may run in five Fath. and when you have brought the Weſtermoſt great white Parch, or Chalk upon *Parch Down* (which is the high Land to the Northwards of *Portſmouth*) a Ship's Length to the Weſtward of *South Sea* Caſtle that ſtands upon the Beach, then you may luff up without Fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the ſhoar, until you come to the Town-walls-end, and there you muſt bear off a little for a Flat, that lieth off from the ſhoar; this is for an Eaſterly Wind. But if you intend for *Stokes-bay*, when you have brought the Fire Beacon on *Brown Down*, which is to the W.N.W. of *Haſlewood* point within a Ship's length without the ſaid Point, then you may bear to the Weſtwards along the outſide of the *Spithead*, which is the ſhoal on the Weſt ſide of the Entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward and deſign for St. *Hellens* Road or *Stoke's-bay*; from *Dunnoſe* to St. *Hellens* Point, the Courſe is N.E. by N. and N.N.E. but borrow no nearer to St. *Hellens* than 6 or 7 fath. for the *Spit* lies off a great way, but if it be clear Weather, that you may keep *Sand Down* Caſtle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; ſteer along in this Mark, until you open St. *Hellens* Church about two Ships length open of the *Red-Cliff* within St. *Hellens* Point or *Port Sea* Caſtle to the Eaſtward of *South Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellen's* Road N.W. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note,

Note, That you have no good clear Ground all along the Iſland until you have opened St. *Hellen's* Church, as aforeſaid, and have brought the Point to bear from you S.S.W.

From St. *Hellen's* Point, to go between *No Man's Land*, and the *Horſe*, the direct Courſe in, is NW. by N. and NW. but you have no ſhoaling upon the S.W. ſide of *No Man's Land*, for you have 16 fathom and the next Caſt but 3; but at the *Horſe* you may ſtand in to 10, 9, or 8 fathom: If the ſtrong Tide be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *No Man's Land*, if it be clear Weather, there are very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the *Iſle of Wight*, that they may be ſeen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth W.S.W. off the Point of *No Man's Land*.

Alſo from St. *Hellens*-point (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a Part of an Old Caſtle formerly called *Haſſlewood* Caſtle, ſtanding on *Gilkeker* Point (which is kept white;) keep *Goſport Church* and that Caſtle in one, or this Caſtle in the middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without fear. Or if the Wind be ſo that you are forced to turn in, then you may run the ſaid Mark within two mils breadth of each end of the Wood. In the middle of the Channel is 11 fathom Water; and if you bring the ſaid Mark right under the North end of the Wood you ſhall run in a middle Ground near the *Horſe* that hath not above 10 foot on it at low water, and hard Sand.

To ſail within the Wight *in thick Weather.*

To ſail between the *Main* and the *Wight* in thick Weather, borrow in 6 fathom off St. *Hellens*, and ſteer N.W. by N. and NNW. from St. *Hellens* Point, till you have 12 fathom, and then ſteer more Weſterly, as you find the Depth; come no nearer *No Mans Land* than 9 or 10 fathom; in that Depth you may keep along the *Wight* Side, if the Wind be ſoutherly; but if it be large, keep in in 14 or 15 Fathom, which is a good Birth from both Sides, and ſo ſteer W. by S. and WSW. as you find the Depth until you come to *Cows*. *Note*, That being about *Stoak's-bay*, there will be leſs Water, if you go nearer to *Cows*, there you may anchor in 12 or 14 Fathom in the midſt of the Channel, where is good owſy Ground.

Directions for Dover *Road.*

The beſt Ground in *Dover Road* is with the *Whiteway*, to the NW. of *Dover Caſtle*, or between that Hill that comes from St. *James* Church, which is a flat Steeple at the North end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwart of *Foulkſtone* in 12 or 14 Fathom is very good Ground.

Directions to ſail into the North Foreland *through the* Gulls *in the Night.*

If your Ground Tackle ſhould fail in the Night riding at the *North Foreland*, as very often hath happened, and you cannot Weather the *Foreland*, weather the *Northſand-head*; if you can but ſee the *North Foreland* Light, when that Light-houſe bears N.W. or N.W. by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering S.S.W.) you may be ſure it will carry you directly through with the *Brake*, but keeping your Lead carefully, and borrowing no nearer the *Brake* than 5 Fathom, nor going without 9 Fathom or nine and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North end of the Goodwin, *for ſuch as ſail from the N.* Foreland *to the Southward in the Night.*

If you be at the *North-foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late, to turn in to the *Downs* with the Wind at S.W. or S.S.W. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh anchor in convenient Time, to be at the *North-ſand-head* at the turning of the Tide, to the Southward. From the *Foreland* you may ſteer out with a Flood Tide S.E. by E. and S.E. or keep the Light of the *North Foreland*, N.W by N. this Courſe will lead you out. But for the more certainty, be ſure keep the Lead well, and then you may borrow off and on with the aforeſaid Winds, in 7 or 8 Fathom, and ſteering out with the aforeſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 Fathom; then you may hale up cloſe to the Southward, along the Back of the *Goodwin*, the Eaſtmoſt ſide of which lies S.S.W. and N. N. E. 12 or 14 fathom; and is not above a Saker-ſhot from the Sand. But if it be in the Day Time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is the flat Church upon the *Foreland* called St. *Peters*, a Ships Length to the Northwards of *Broad-ſtairs* Peer-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtwards, till the *South Foreland* bears W. by S. then Caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Downs* Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet *and by the Naze into* Harwich.

Sailing down the *Swin* or *King's Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits* the Buoy lieth in 5, 6, or 7 foot Water at low Water; and the Paſſage often alters, ſometimes more Water ſometimes leſs. The Buoy lieth on the Weſt end of the *Gunfleet* Sand, and the Eaſt end of the *Buxey*, bearing from a flat Steeple, called *Great Holland Church*. South and by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, ſix, ſeven and 8 fathom Water; the Sand lying without, makes it a moſt excellent Road. There is a good and deep

Channel

hannel to ſail in at the *Wallet*, between the *Gunfleet* and the *Weſt* Rock, ut 'tis ſeldom uſed. Being over the *Spits*, in the *Wallet*, ſteer away for he *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on , keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone ank which hath but 5 Foot Water on it at low Water; and lieth from the *Naze* Trees E. by N. About a Mile and a half from the *Naze* Point, there about 8 or 9 Foot Water between it and the *Naze* at low Water; keep *Payn's* Trees which lie a little to the Southward of *Harwich*, open and ſhut ith *Harwich Cliff*, and this Mark will carry you on the Stone Banks, and he Trees on the *Corkland*, juſt open of the *Nazeland*, will carry you on the ank alſo. There is a good leading Mark to carry you between the *Naze* nd the ſtone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff; nd will alſo carry you between the *Pyeſand*, and the Ridge and the *Rowling round*, where Ships anchor in 3 and 4 Fathom at low Water. The Mark anchor in the beſt of the *Rowling-Ground*, is to bring *Harwich Windmill* ſails breadth open of *Harwich Cliff*: And to ſail from the *Rowling Ground* the *Naze*, keep *Payn's* Trees open of *Harwich Cliff*, till you bring the *Naze* bear S.W. then keep *Harwich* Steeple, on the Beacon *Cliff*, to run within he ſtone Bank. There is a Channel to ſail from the *Naze* between the ork Sand and the Ridge, keeping the *Naze* Trees S.W. ſailing down N.E. etween the Cork and the Ridge, in 5, 6, and 7 Fath. Water. And when ou have brought *Harwich* Steeple with the Brewhouſe that lieth to the N. ard of *Languard Fort*, then are you clear of the Cork Ledge: this Chanel is much uſed by the Light *Colliers* going to the Northwards.

Being in the *Rowling Grounds*, and that you would ſail into *Harwich* Harbour, keep cloſe by the *Andrews*, which is a Sand that lieth off from *Languard Fort*, and is ſteep too on the Weſt ſide; The Tide of Ebb runneth rong over the *Andrews* the firſt half Ebb, of which you muſt have a Care. This Sand is dry at low Water; keep cloſe by the Beach of *Languard Fort*, avoid the *Alter*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard* Fort, about a Cable and a half's Length from the Beach at the ort, on which is but 5 and 6 Foot at low Water. You may ſail to the Weſtward of it, between it and *Harwich Cliff*, according as the Tide is up, nd what Draught of Water your Ship draweth: but if you ſhould want go into *Harwich* at low Water, and a Ship draw above 16 Foot, you muſt ſtay for the Flood to have Water over the *Glutton*, which is a narrow idge and ſtretcheth off from the Beach thwart the Channel, a little ithin the Brewhouſe, this is to the Northward of *Languard Fort*: Being aſt the *Glutton*, you muſt keep cloſe to the *Beach*, to avoid the Griſtle, hat lieth in the middle between *Harwich* and the *Beach* of *Languard* Fort, n which is but three Foot at low Water, there is a ſmall Channel beween the Griſtle and the Guard, of 9 Foot at low Water, but when you ave opened *Dover* Court Church of *Harwich* Town, then are you clear of he Griſtle and the Guard, and may Anchor before the Town of *Harwich*,

in

in 5 Fathom Water, to run into *Ipſwich* Water, and Anchor; this is a ver ſafe Harbour, and if a Ship ſhould chance to blow a ſhore ſhe cann take harm, the Shores being ſoft owſe. The Spring Tides riſe 15 an 16 Foot, and the Neap-Tides 10 and 11 Foot.

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and that you will not ſail over the *Spit* then keep down by the *Gunfleet Sand*, in 7 or 8 fathom Water till you com within two Mile of the Buoy of the *Gunfleet*, and then come no nearer tha 9 Fathom Water, for there lieth off a *Spit*, E S E. from the Sand abou Cable's length; to the Eaſtward of this *Spit* is a ſmall Swatch through th Sand, into which, and *Goldmores Gat*, the Tide of Flood ſetteth ſtrong int the *Wallet*, of which you muſt have a Care when you come near it, eſpe cially in little Winds or Calms, you may be haled on the *Gunfleet-Sand* this Sand lieth NE. and SW. and drieth in ſeveral Places: The Buoy the *Gunfleet* beareth from the *Naze* SE. by E. Eaſterly; you may into 7 or 8 Fathom along the ſide of the W. Rock into the *Sledway*, kee ing *Balſey Church*, N. by W. and N.N.W. till you bring *Harwich* Steepl on the Brewhouſe, (that lieth to the Northward of *Languard Foot*) whic will carry you clear of the Cork Ledge, on which is two Fathom and half at low Water, and then ſtand to the Weſtward, and keep *Orfor* Church and Caſtle open of *Balſey Church* a ſails Breadth, till you have th Lights together, keeping them ſo till you are paſt the *Andrews*, and the follow the former Directions for ſailing into *Harwich*: you muſt ſtand i upon the *Platters* into 5 Fath. on which Sand is but 2 or 3 Foot at low Wa ter; the Ridge hath 7 Foot at low Water; a great part of the Cork San drieth at low water; and lieth in length N.E. and S.W. about two Mil and a half long, and a Mile broad; Weſt Rocks lieth in length N.E. and Weſt about 3 Miles, and 2 Miles broad, and drieth at ſeveral Places, fu of Banks and Swatches, the Ground rocky and ſtony in many Places, the is a ſmall narrow Channel between the Weſt Rocks and the Cork.

For the more particular Directions for ſailing into theſe and other Ha bours in *England*, *Scotland*, *Holland*, *Normandy*, *Bretaigne*, *&c.* ſee the l Edition of the Coaſting Pilot, newly Corrected and Reprinted for M *Mount* and *Page* on *Great Tower-Hill*, *London*, With many Additions.

F I N I S.